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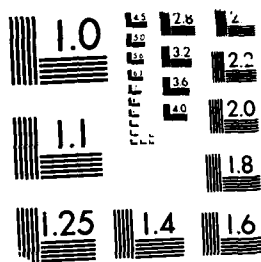
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**BUHNE POINT SHORELINE EROSION  
DEMONSTRATION PROJECT**

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**FINAL**

**APPENDICES VOL. IV  
H-L**

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**SAN FRANCISCO AND LOS ANGELES DISTRICTS  
CORPS OF ENGINEERS**

**LOCAL SPONSOR**

**HUMBOLDT BAY HARBOR, RECREATION AND CONSERVATION DISTRICT**

**AUGUST 1987**

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report provides detailed information on the rebuilding of the Buhne Point marine beach, the construction of retaining structures, and the establishment of native dune vegetation to prevent wind erosion. The various appendices which are part of the report thoroughly document physical and numerical model studies done at the Waterways Experimentation Station (WES) in Vicksburg Mississippi for the structures and beach, as well as the post-construction and post-planting monitoring programs. (continued)		

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20. Abstract, continued.

Buhne Point is located about 250 air miles north of San Francisco, on the east shore of Humboldt Bay, Humboldt County, California. A natural sand spit was located on the western face of the point, but the area lies directly in line with wind and waves entering Humboldt Bay from the Pacific Ocean. Reports of erosion there have been recorded since the mid-19th century. By the late 1970s, erosion had become so severe that the beach had disappeared, and the shoreline had eroded back to the roadway, threatening the road and underground water, gas and sanitary sewer lines. Storm waves 10' in height are common, and were sending rock flying across the road and against adjacent homes of the community of King Salmon.

In 1982, Congress included the area in an authorization to the Federal Highway Administration to undertake a demonstration project to apply "state-of-the-art methods for repairing damage to highways and preventing damage to highways resulting from shoreline erosion." A four-year, four-phase program was implemented, and is described in this final report.

The First Phase consisted of designing and constructing a 1,250' timber groin and a 200' long rubble-mound head to prevent sand from being transported south, downcoast.

Phase II consisted of placing 600,000 yds<sup>3</sup> of fine-to-medium grain sand to reform the almost-24-acre beach.

In Phase III, a 1,050' shore-connected, rubble-mound breakwater was constructed on the northerly face of the beach. The Phase I timber groin and breakwater was given an additional 425' arched extension.

Phase IV consisted of vegetating the sandfill with native plants. The vegetation program included experimental collecting and growing of 20 different native and naturalized species for a two-year period, and then extensive plantings and monitoring.

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## APPENDIX H

### BUHNE DRIVE RECONSTRUCTION REPORT;

Physical modeling program and report. Environmental elements and reconstruction report. Operation and maintenance manual, steel committee meeting. Keywords: Beach restoration, Dune restoration, Shoreline erosion control, Native plants.



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BUHNE POINT BEACH RESTORATION DEMONSTRATION PROJECT  
ROAD PORTION

Upon notification from the FHWA that Congress had appropriated \$9 million for this project, coordination meetings were commenced with the following representatives:

- 1) Humboldt Bay Harbor & Recreation Commission
- 2) Federal Highway Administration
- 3) U.S. Army Corps of Engineers
- 4) Caltrans
- 5) California Department of Boating & Waterways
- 6) Humboldt County Department of Public Works
- 7) Pacific Gas and Electric
- 8) Residents of King Salmon

At the initial meetings the division of labor for the project was set up. The initial work, to be accomplished with a \$495,000 grant from CalBoating, was to construct a 1200 foot groin on the south end of the project. The next phase, to be accomplished by the Corps of Engineers, was the dredging and stockpiling of sand. The third phase, also by the Corps, was to construct the rock groins to contain the sand. The fourth phase was the reconstruction of the road which is the subject of this report.

As the road was one of the later items to be constructed, only a minimal amount of design was initially done in order to tell the Corps what space should be left for the road in their plans. In addition, a tentative profile grade was established to help determine the final contours of their dredged material in the vicinity of the road.

The County already owned a 50 foot right-of-way at this location and wanted to utilize it as much as possible. However, two items affected our decision to move slightly to the west. The utilities (P.G.&E. and Pacific Bell) requested that they be allowed to underground their overhead utility lines. As it is the County's policy to do this at every opportunity, an underground utility district was formed and the lines were authorized to be undergrounded. Also, as our road would most likely be at a higher elevation than the existing ground, some room to slope and transition from the back of our sidewalk to the existing yards was needed.

It was decided that the utility undergrounding would take place in a five foot wide corridor along the east edge of our Buhne Drive right-of-way. This same five foot space would be utilized for the slope transition needed to compensate for the difference in elevations. Therefore, our 50 foot wide roadway section, consisting of 2-12 foot lanes, 2-8 foot parking shoulders, and 2-5 foot sidewalks was moved to the west onto property owned by the Harbor District. The existing navigational beacon maintained by the Coast Guard was an obstruction to the project, and with early coordination efforts was relocated by the Coast Guard during the early stages of construction.

Any potential problems with trying to coordinate with the Corps or their contractor in determining the slope hinge point on the west side was avoided by telling them to flatten the sand to the desired elevation and we would construct our project based on whatever condition existed when their project was completed.

The vertical alignment contemplated during design ranged from an elevation about five feet higher than the old road to a grade that matched the old road. The higher elevation was considered because it would act as a dike to protect homes to the east. However, as the Corps project developed, we began to realize that additional protection would not be needed. The residents along Buhne Drive also wanted a lower profile grade to retain as much of their view to the west as possible so this decision was well received.

The next profile grade to be given serious consideration was a straight grade from the Coast Guard beacon, the high point, to the south end of Buhne Drive. This grade would have allowed any water falling on the street to be transported to the south and discharged to the bay with no affect on any of the side streets. Due to the small volumes of water involved and the relatively flat grades involved, it was felt that possibly blowing sands from the beach area would settle into the storm drain and cause a continuous maintenance problem.

For this reason it was decided to keep the waters on the surface to the maximum extent possible. This meant an undulating grade whereby water could be discharged down side streets and then be transmitted to the inlets in Fisherman's Channel via pipes controlled by flood gates. As we were discharging minor additional waters into these pipes, they were upgraded as part of the project.

With the preliminary design information in hand, a public meeting was held on March 27, 1985, to discuss the project with the residents of the area. Approximately 25 people attended and acceptance of all phases of the project was expressed. A number of residents did request additional width on King Salmon Drive for a walking, jogging and bicycle path. It was explained that it was not assured that any work could be done on King Salmon Avenue. In addition, if work was allowed involving widening to accommodate additional uses, then wetlands would be covered on either side of the road. This item was not covered in the environmental documents and would take too long to get permitted.

The matter of an overlay to King Salmon Avenue was presented to the FHWA at an early date. The initial position was that only Buhne Drive was to receive any work. However, as the Corps project progressed and King Salmon Avenue deteriorated due to the heavy truck traffic, the FHWA relented and also allowed an overlay on this section of the road. A deflection study was utilized to indicate the amount of deterioration of the subgrade and surfacing.

Another item of note that is not our standard design was the installation of a barrier wall on the west side of the west sidewalk. This wall was designed to fulfill two functions. It was to act as a barrier to motorized vehicles and it was to act as a sand fence to keep drifting sands from encroaching on our roadway. The design was approved by the



Harbor District as they will maintain the facility upon completion. The design of this facility incorporated wheelchair ramps with new crosswalks at each block and wall openings to the beach at these points.

Prior to advertising the project, we were notified by the Corps that they had surplus sand and wondered if we needed material for our project. We did and revised our plans to indicate the on-site source. We utilized approximately 7000 cubic yards of the sand and the remaining 5,000± cubic yards was disposed of behind the rock groin on the north end of the Corps project as approved by the Corps.

The project was advertised and the low bidder, Mercer-Fraser, was awarded the contract. The low bid of \$406,161.50 was 26% below the engineer's estimate. There were no out of the ordinary problems during construction worth discussing. Underlying native material throughout the project was beach sand and was relatively easy to grade and compact. The road portion of the project was accepted on October 2, 1985, 1985, but the contract was kept open until November 22, 1985, as the contractor was retained to do some additional planting under extra work. This work was delayed until the rainy season in order to reduce any watering needed on the new growth. The complete project was accepted on November 22, 1985.

## **APPENDIX I**

**SECTION 1 PHYSICAL MONITORING PROGRAM**

**SECTION 2 PHYSICAL MONITORING REPORT**

# **SECTION 1**

## **PHYSICAL MONITORING PROGRAM**

1

RUHNE POINT SHORELINE EROSION  
DEMONSTRATION PROJECT

MONITORING PROGRAM

SEPTEMBER 1984

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## INTRODUCTION

1. The Buhne Point Shoreline Erosion Demonstration Project is being conducted for the Federal Highway Administration by Humboldt County, the State of California, and the U.S. Army Corps of Engineers (San Francisco and Los Angeles Districts). The project is located in Humboldt Bay, California, approximately 225 nautical miles north of San Francisco. The three phase project is designed to restore the badly eroded Buhne Spit to provide protection from wave attack to Buhne Drive, the only public access road into the adjacent community of King Salmon (see Fig. 1).
2. Phase I of the project was designed and constructed by the California Department of Boating and Waterways and the County of Humboldt. It consists of a timber baffle groin designed to stabilize the Phase II sandfill and to prevent the material from being transported downcoast (south) into Fields Landing Channel (Fig. 2). The groin is 1,250 feet long and roughly parallels Fields Landing Channel for 1,000 feet, then curves for 250 feet northward at a radius of 600 feet. The head of the groin is protected by a 200-foot long rubble mound groin. Toe protection to prevent scouring is provided on the downcoast (south) side of the groin and consists of quarry waste and one-ton stone. A filter fabric on the upcoast side is provided to prevent sand from passing through the timber baffle groin.
3. Phase II of the project, designed and constructed by the Corps of Engineers consists of restoring the sand spit at Buhne Point. The sandfill material was excavated by hydraulic dredge from a 4,000 by 400-foot borrow area located inside Humboldt Bay just north of the main entrance channel. Six hundred thousand (600,000) cubic yards of material was placed upcoast (north) of the timber groin and along Buhne Drive, forming a fill of approximately 23 acres. The crest elevation of the fill was initially placed at 16-17 feet MLLW to reduce erosion losses between Phase II and Phase III construction. The sandfill will be spread out during Phase III construction to plus 12 feet MLLW.
4. Phase III of the project is designed to stabilize the sandfill on a long-term basis. Phase III will consist of rock revetment placed along the downcoast face of the Phase I timber groin, a 425-foot rubble mound extension of the Phase I timber groin and a 1,050-foot rubble mound shore connected breakwater located at the upcoast end of the Phase II sandfill (Fig. 2). Phase III will also include stabilization measures to protect the sandfill from wind erosion. These measures will include sand fence installation during Phase III construction and revegetation of the sandfill subsequent to Phase III construction.

## MONITORING PROGRAM

5. The major objective of a monitoring program is to document the performance of a project and its impact on the nearshore zone surrounding the project. In addition, this particular program will give the Corps of Engineers an opportunity to study a uniquely designed project from its completion through the first two years of its effective project life.

6. The proposed 2-1/2 year monitoring program will consist of physical and biological monitoring beginning at the completion of the Phase II construction (Fig. 7). Specifically, the program will consist of twice-yearly hydrographic, topographic (aerial) surveys and twice-yearly soil samplings. These surveys are outlined in the following paragraphs.

7. Hydrographic and Foreshore Surveys will be conducted together by the San Francisco District, Corps of Engineers. The surveys are scheduled to be taken once between Phase II and Phase III, twice yearly after the completion of Phase III and once in the event of an extraordinary climatic event. This gives a possible total of six surveys. The cost for one set of surveys is \$12,000 for a possible total cost of \$72,000.

8. The hydrographic survey will include the entire nearshore area surrounding the fill from Fisherman's Channel upcoast through Fields Landing Channel to the revetment along the PG & E power plant (Fig. 3). The foreshore surveys will cover the area from the waterline to the top of the beach berm. The analysis of these surveys will include the drafting of beach and foreshore cross-sections and calculations of volume changes (erosion/accretion quantities).

9. Aerial surveys will be conducted in conjunction with the hydrographic surveys for a possible total of six surveys (Fig. 4). Analysis of stereo aerial photographs will provide topographic and configurational information on the sandfill. This will enable the Corps of Engineers to monitor movement of the sandfill. The cost for each aerial survey is \$6,000 for a possible total of \$36,000. The aerial surveys will be conducted and analyzed by the Los Angeles District Corps of Engineers.

10. The hydrographic and aerial surveys will be used to detect volume changes and determine rates of sand movement on and around the sandfill area. In addition, these surveys will aid in directing soils exploration to specific areas of sand movement.

11. Sand Sampling and Analysis. Push-tube samples will be taken in and offshore of the fill and on the downcoast side of the Phase I timber groin (Fig. 5). The sampling period will be in conjunction with but taken after the hydrographic surveys. This sampling scheme will direct exploration to key locations where sand movement can be monitored. Analysis of the samples for average grain size and grain size distribution will be used to determine correlation between the borrow area material, and the material in and offshore of the sandfill area. The cost for each sample collection and analysis will be \$6,000 for a total of \$36,000. The sampling will be conducted by the San Francisco District, and the grain size analysis will be conducted by the South Pacific Division Soils Laboratory.

12. Biological Monitoring. Biological monitoring is being addressed under separate cover by the Vegetation Planting/Monitoring Report.

13. LEO Data Collection Program. The Littoral Environment Observation (LEO) program will be used in monitoring littoral transport resulting from incident wave action. The LEO program was developed by the US Coastal Engineering Research Center (CERC) as a low-cost method to provide data on nearshore waves, longshore and rip currents, wind conditions and beach conditions.

It is expected that two observers with two back-ups could easily accomplish the data collection. The citizens of King Salmon have already expressed an interest in participating in the LEO program, but no definite commitments have been obtained. Alternative arrangements to hire local college students will be made in the event there are no volunteers.

Observers will obtain daily measurements of breaker height; wave period; direction of wave approach, wind speed, wind direction, current velocity and beach slope; and will record the presence of beach cusps and rip currents. The observers will make visual estimates with the help of simple, inexpensive equipment. A sample data sheet is provided in Figure 6. Twenty observations will be made each month, with a maximum of two per day. The data will be sent once a month to Coastal Engineering Research Center (CERC), who, in turn, issues monthly and yearly statistical analysis of the observations. The data acquisition, CERC analysis, and twice yearly progress reports will be coordinated by the Los Angeles District Corps of Engineers. The cost of running the LEO program is \$3,000 per year, for a total of \$6,000 for two years.

14. Site Inspection Periodic site inspections will be made by the San Francisco and Los Angeles Districts, Corps of Engineers. The inspectors will take photos of the sandfill and report on the general conditions.

The inspections will be made monthly by the San Francisco District, starting immediately after the completion of Phase III and ending two years later. The cost for site visits is \$5,000. Inspections will be made twice a year by the Los Angeles District. The cost has been included in the Los Angeles District Study Management cost.

#### DATA ANALYSIS

15. The analysis of data will consist of integrating the results of the surveys to document and evaluate shoreline changes of the reconstructed Buhne Spit over space and time and to relate these changes to climatic events. The results of the analysis will be presented in the final report. Specific objectives of the analysis are to:

- a. Document changes in the bottom contours in the nearshore zone.
- b. Document changes in topography on the reconstructed spit.
- c. Document changes in grain size distribution of sediments on the spit and in the nearshore area.
- d. Monitor the progress of revegetation measures.



e. Monitor wind and wave climates associated with the aforementioned objectives.

f. Document aeolian transport on the spit using wind and windfall data compiled by the Pacific Gas and Electric Company and the U.S. Coast Guard in Eureka, California.

This monitoring program, through the data analysis, will enable the Corps of Engineers to develop a quantitative as well as qualitative account of the performance of the project. This program will also provide the Corps with an opportunity to verify the qualitative results of the model tests for sand movement. Finally, the program will allow the Corps of Engineers to establish an Operations and Maintenance Manual. This manual will serve as a guide for the ownership responsibilities when the project ownership is transferred to the Humboldt Bay Harbor Recreation, and Conservation District.

#### COST ESTIMATE

16. Figure 7 shows the monitoring schedule and costs; figure 8 shows spending by fiscal year. The schedule is based on January 1985 completion of Phase III construction. The costs include overhead.

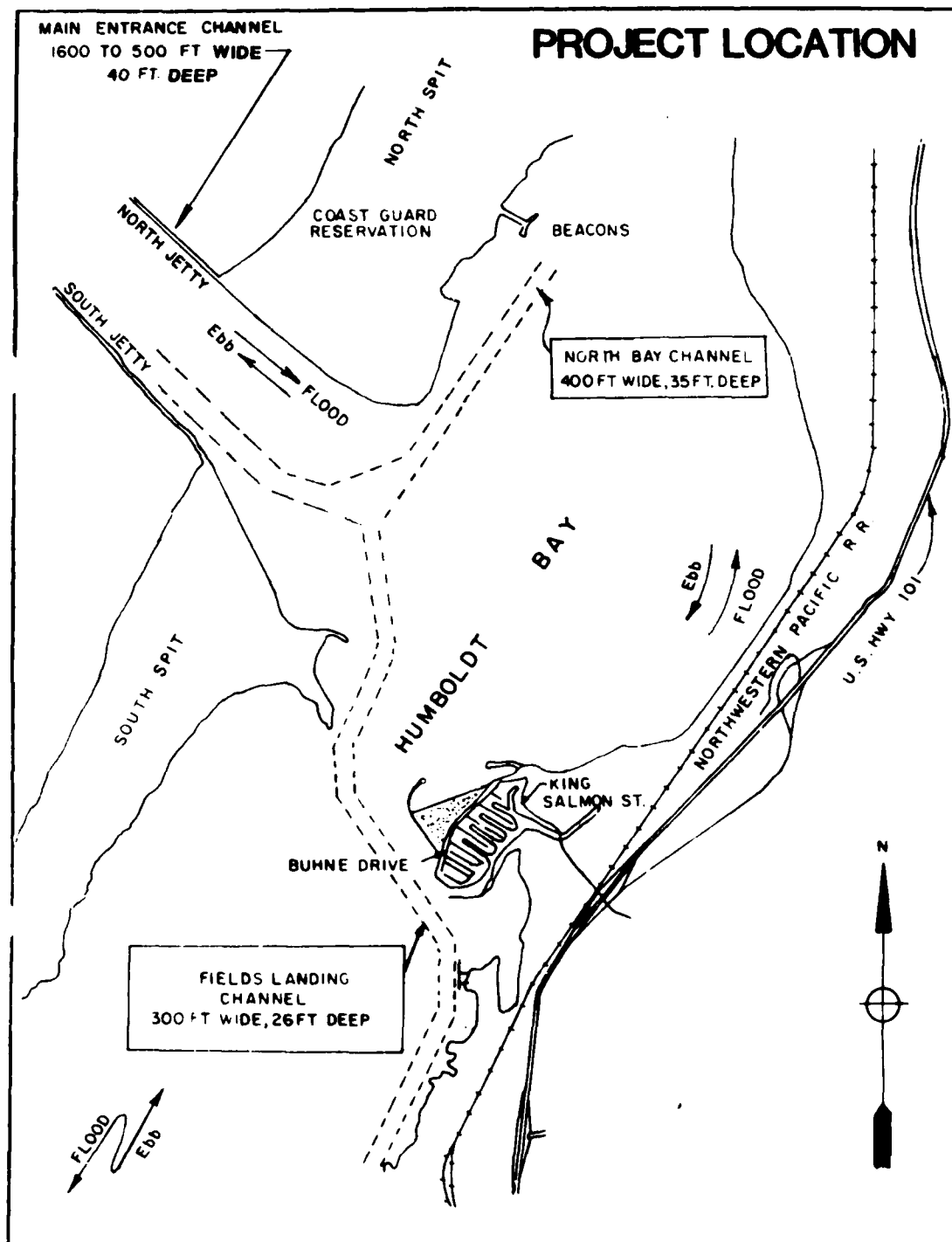


Figure 1

## PROJECT PLAN

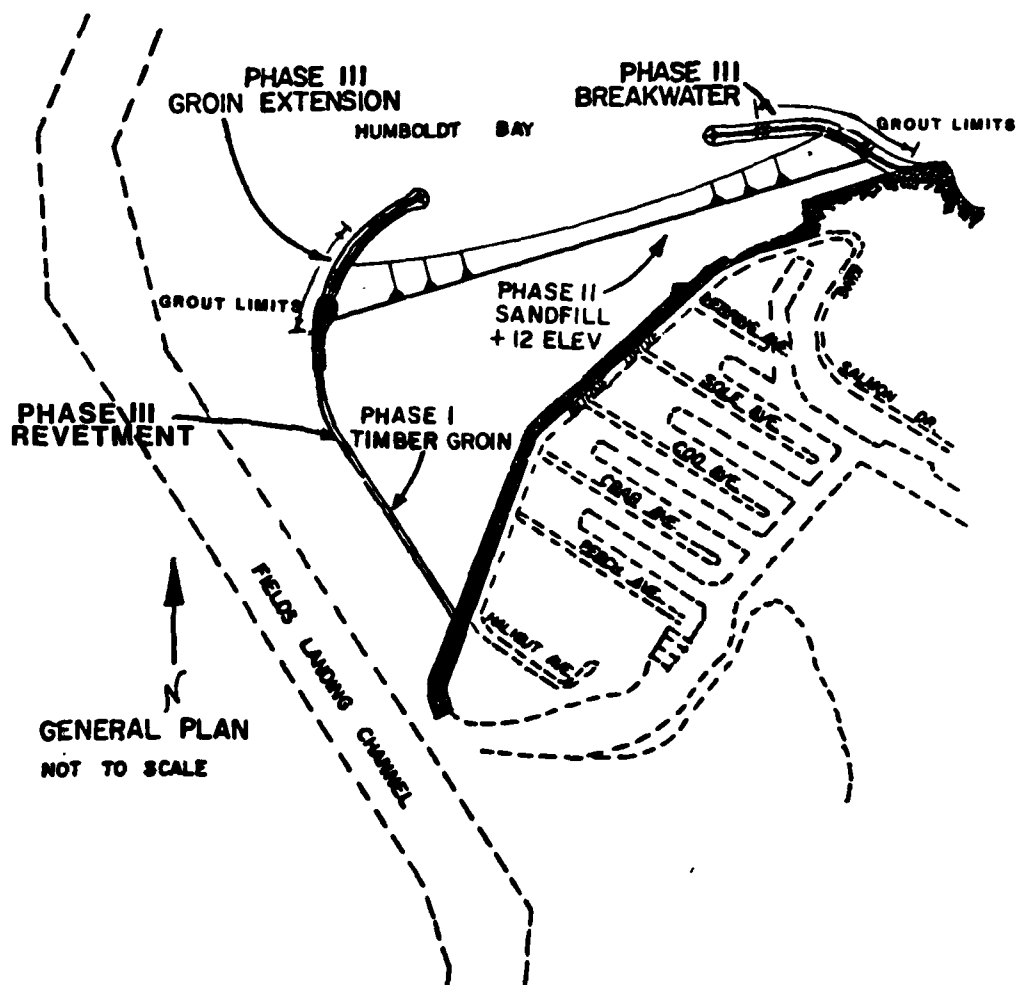


Figure 2

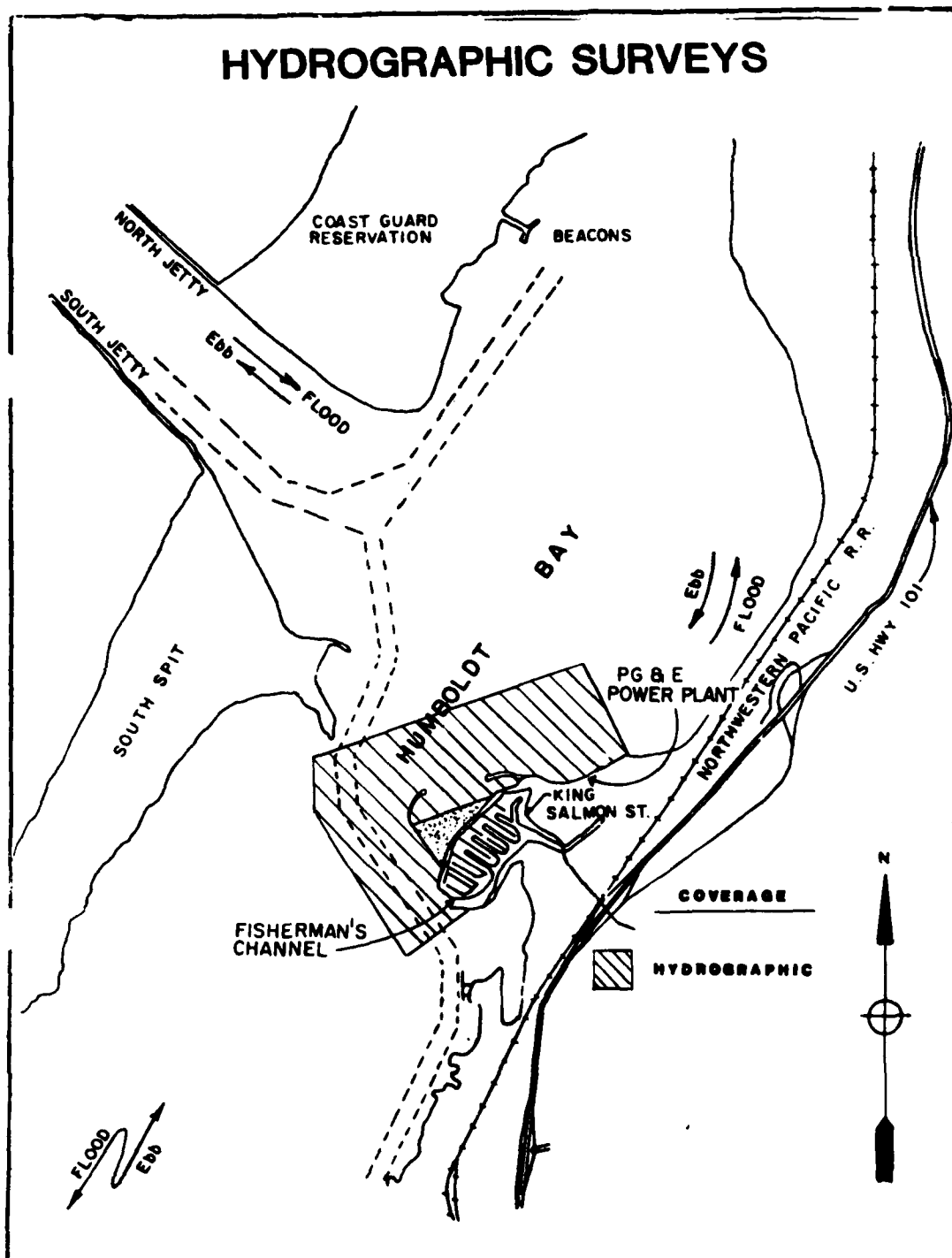


Figure 3

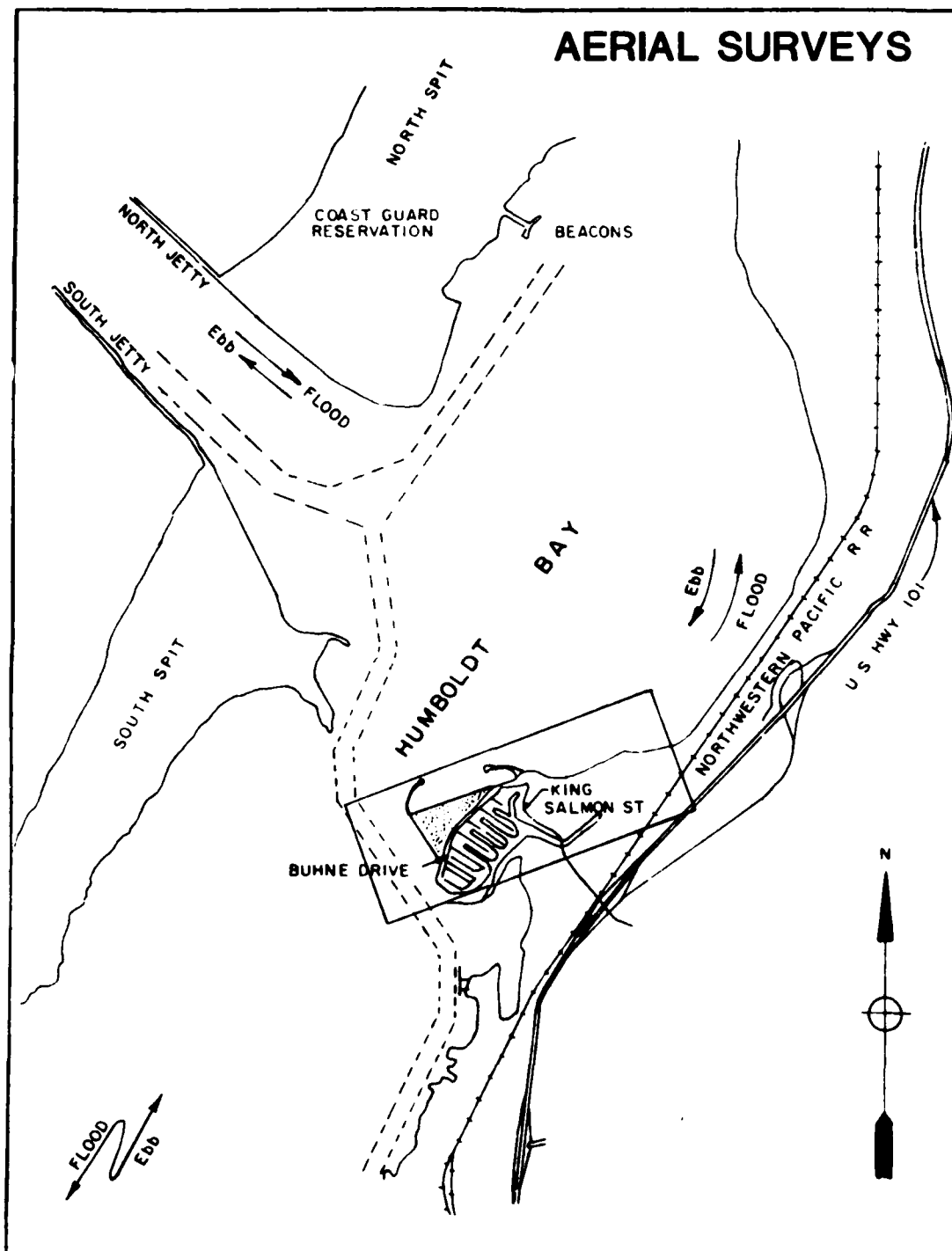


Figure 4

# SOILS EXPLORATION

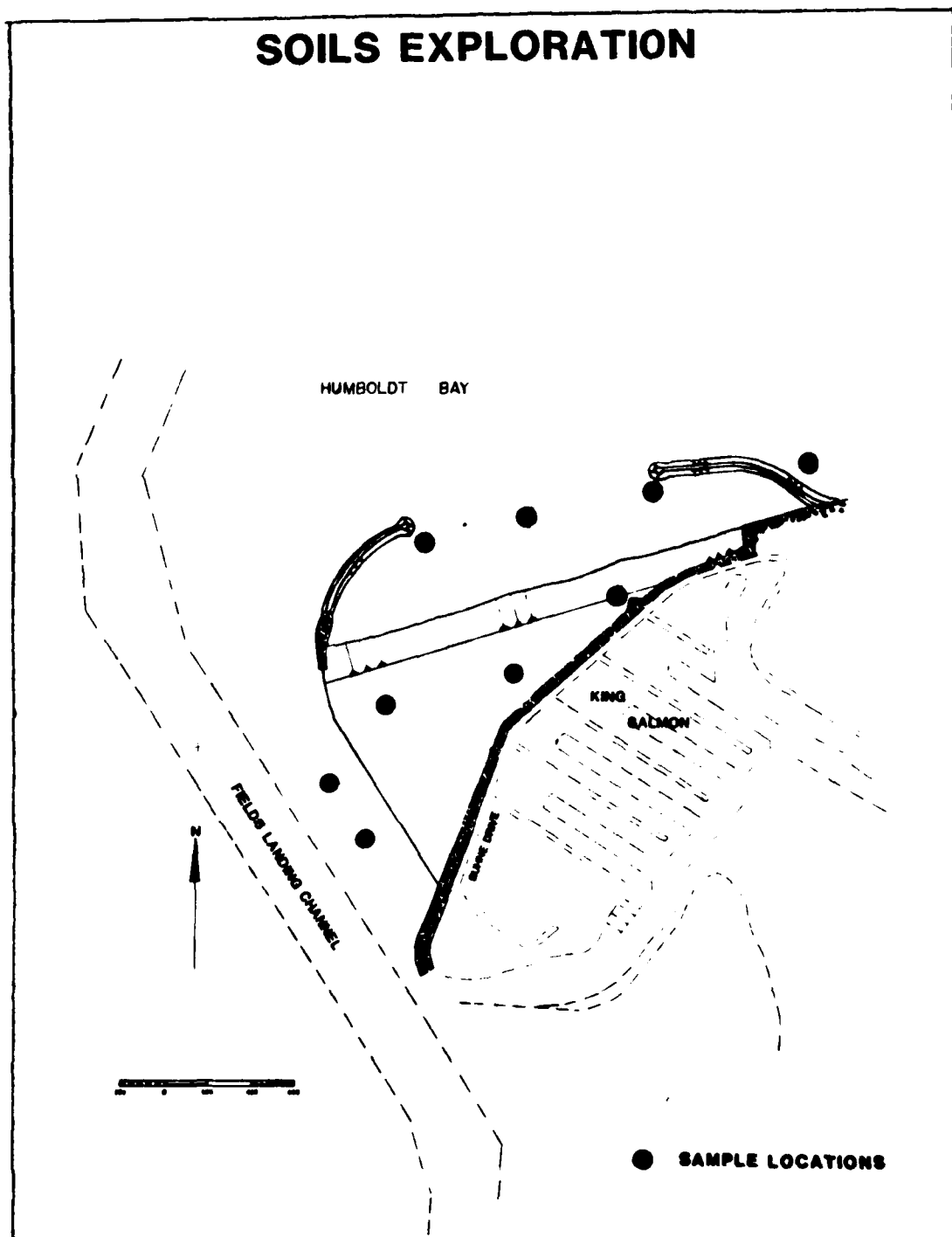


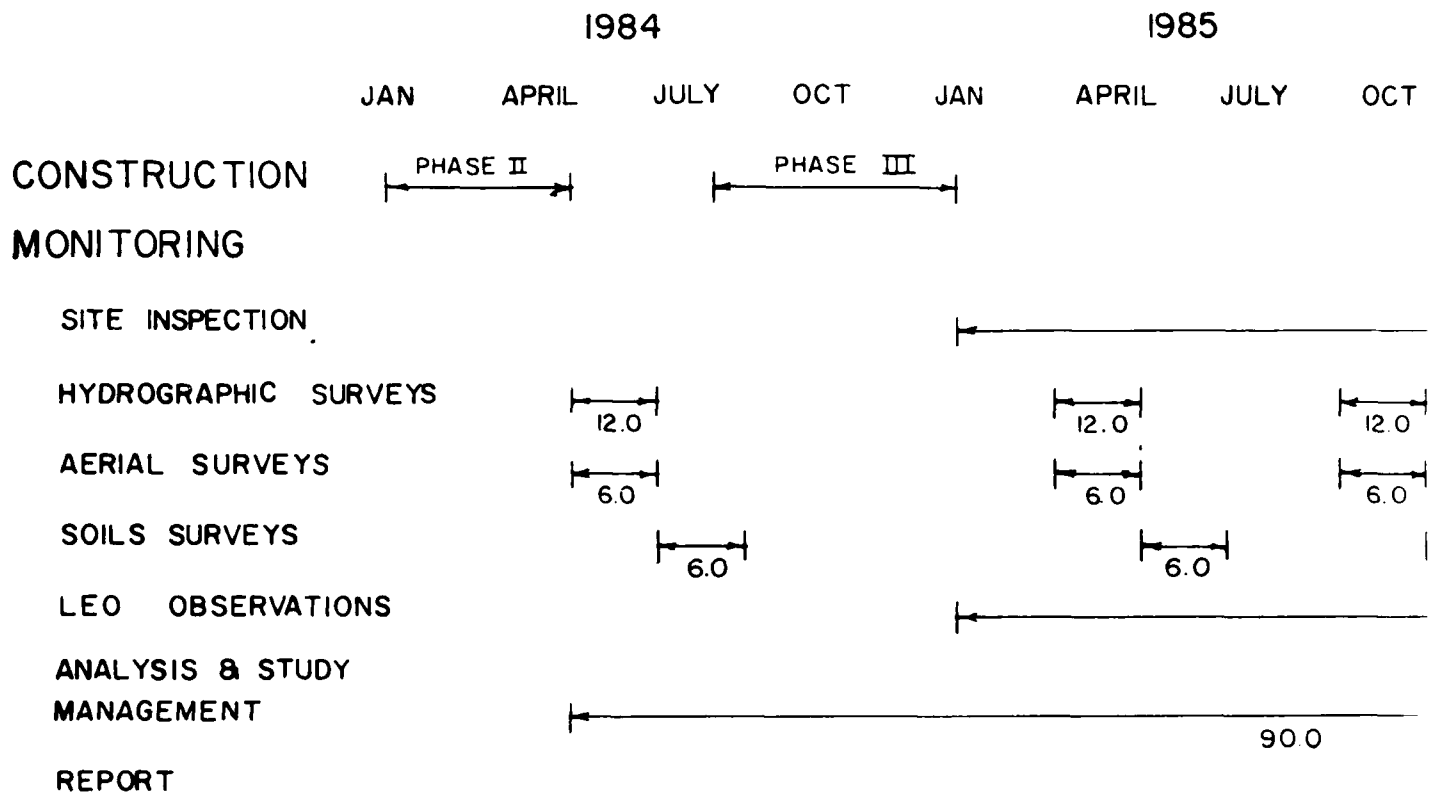
Figure 5

# LEO SAMPLE DATA SHEET

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RECORD ALL DATA CAREFULLY AND LEGIBLY													
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<b>WAVE PERIOD</b> Record the time in seconds for eleven (11) wave <u>crests</u> to pass a stationary point. If calm record 0.				<div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div>		<b>BREAKER HEIGHT</b> Record the best estimate of the average wave height to the nearest tenth of a foot.				<div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div>			
<b>WAVE ANGLE AT BREAKER</b> Record to the nearest degree the direction the waves are coming from using the protractor on the reverse side. 0 if calm.				<div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div>		<b>WAVE TYPE</b> 0 - Calm      3 - Surging 1 - Spilling    4 - Spill / Plunge 2 - Plunging				<div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div>			
<b>WIND SPEED</b> Record wind speed to the nearest mph. If calm record 0.				<div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div>		<b>WIND DIRECTION</b> - Direction the wind is coming from 1 - N    3 - E    5 - S    7 - W    0 - Calm 2 - NE   4 - SE   6 - SW   8 - NW				<div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div>			
<b>FORESHORE SLOPE</b> Record foreshore slope to the nearest degree.				<div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div>		<b>WIDTH OF SURF ZONE</b> Estimate in feet the distance from shore to breakers, if calm record 0.				<div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div>			
<b>LONGSHORE CURRENT</b>						<b>DYE</b> Estimate distance in feet from shoreline to point of dye injection.				<div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div>			
<b>CURRENT SPEED</b> Measure in feet the distance the dye patch is observed to move during a one (1) minute period. If no longshore movement record 0.						<div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div>		<b>CURRENT DIRECTION</b> 0 - No longshore movement +1 - Dye moves toward right -1 - Dye moves toward left				<div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div>	
<b>RIP CURRENTS</b> If rip currents are present, indicate spacing (feet). If spacing is irregular estimate average spacing. If no rips record 0.										<div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div>			
<b>BEACH CUSPS</b> If cusps are present, indicate spacing (feet). If spacing is irregular estimate average spacing. If no cusps record 0.										<div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 2px;"></div>			
<b>PLEASE PRINT</b>													
_____ <b>SITE NAME</b>						_____ <b>OBSERVER</b>							
Please Check The Form For Completeness													
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CERC 113-72 8 Mar 72													
Make any additional remarks, computations or sketches on the reverse side of this form.													

FIGURE 8

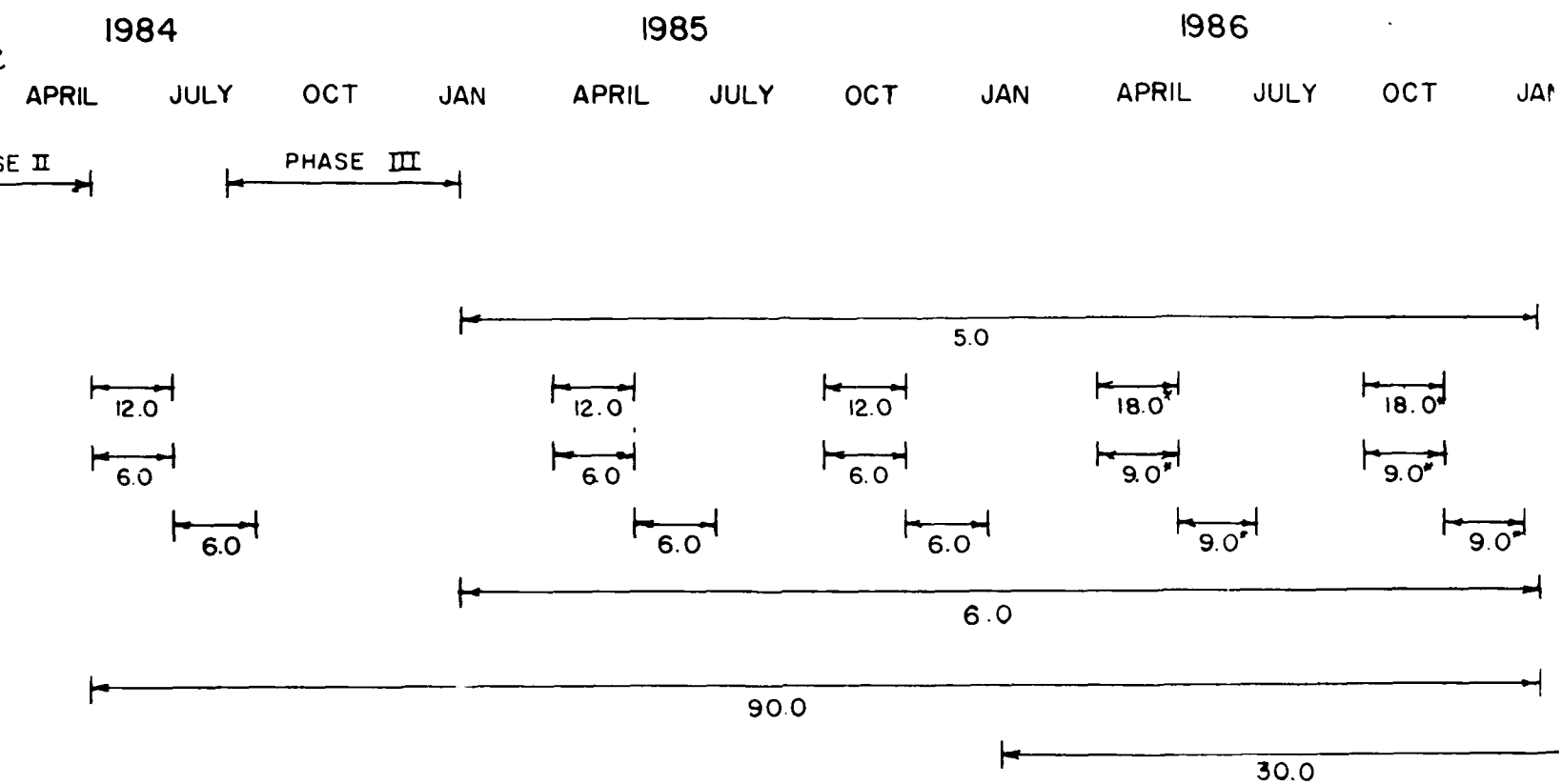
# BUHNE POINT MONITORING SCHEDULE AND CO




┌───┐ SAMPLING PERIOD  
 5.0 COST IN \$1,000  
 5.0\* FIGURES INCLUDE POST-

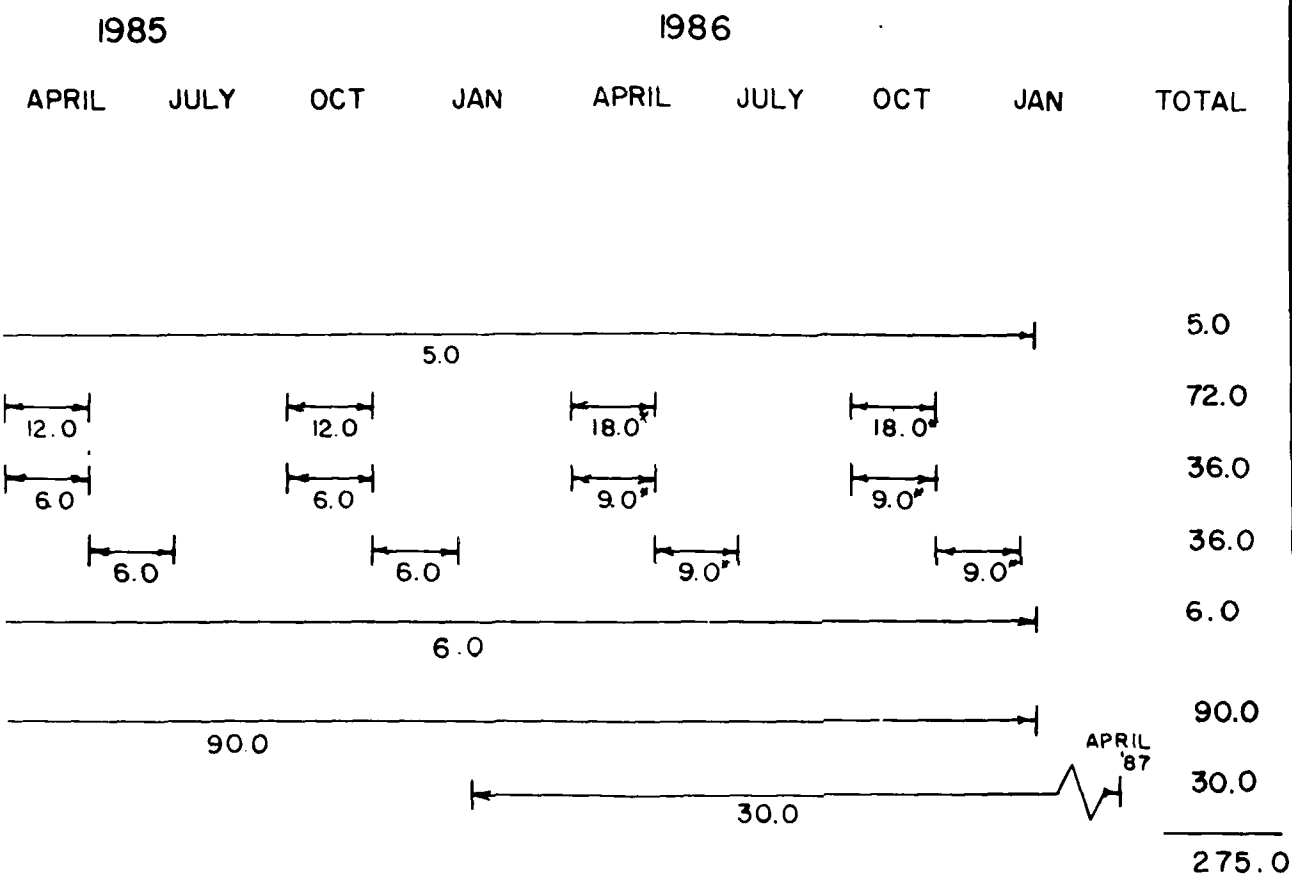


# BUHNE POINT MONITORING STUDY SCHEDULE AND COSTS



 SAMPLING PERIOD  
 5.0 COST IN \$1,000  
 5.0\* FIGURES INCLUDE POST-STORM SURVEY

# POINT MONITORING STUDY SCHEDULE AND COSTS



SAMPLING PERIOD

COST IN \$1,000.

FIGURES INCLUDE POST-STORM SURVEY

FIGURE 7

BUHNE POINT MONITORING  
SPENDING BY FISCAL YEARS

	1984	1985	1986	1987	TOTAL
HYDROGRAPHIC SURVEY	12.0	18.0	33.0	9.0	72.0
AERIAL SURVEY	6.0	9.0	16.5	4.5	36.0
SOILS SURVEY	6.0	6.0	15.0	9.0	36.0
LEO PROGRAM	—	2.25	3.0	.75	6.0
ANALYSIS & STUDY MANAGEMENT	14.4	33.6	33.6	8.4	90.0
SITE INSPECTION	—	19	2.5	.60	5.0
REPORT	—	—	18.0	12.0	30.0
	<u>38.40</u>	<u>70.75</u>	<u>121.60</u>	<u>44.25</u>	<u>275.0</u>

FIGURE 8

## **SECTION 2**

### **PHYSICAL MONITORING REPORT**

BUHNE POINT SHORELINE  
EROSION DEMONSTRATION PROJECT

PHYSICAL MONITORING REPORT  
DACW09-87-D-0027, D.O. #01

Prepared for  
San Francisco and Los Angeles Districts  
U.S. Army Corps of Engineers

Prepared by  
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250 W. Wardlow Road  
Long Beach, CA 90807  
L-2434.01

August 1987

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#### PURPOSE

This report documents the physical monitoring program data, analyses and results for the Buhne Point Shoreline Erosion Demonstration Project. The purpose of the monitoring program was to document the performance of the project and its impact on the nearshore zone surrounding the project.

#### SCOPE

Data collected from aerial topographic surveys, hydrographic surveys, littoral environment observations, soil sampling and a site inspection are presented in this report. Analyses were conducted to quantitatively investigate volume changes and sediment transport paths on and offshore of the reconstructed spit, and in Fields Landing Channel. A summary of the Littoral Environment Observation (LEO) data and soils analyses are presented. A site inspection was conducted to inspect the integrity of the project's structures. The aforementioned investigations are evaluated by season and significant storm events and compared with the qualitative results from the physical model studies conducted by the Corps of Engineers.



## PROJECT DESCRIPTION

Buhne Point is located in Humboldt Bay, Humboldt County, California directly across from the entrance channel jetties. Buhne Spit, the project area, is located just downcoast of Buhne Point. The Buhne Point area has had a long history of almost continuous erosion. Waves, generated in deep water, enter through the entrance jetties and impinge on Buhne Point. In the last decade, the erosion of Buhne Spit accelerated to the point where Buhne Drive, the only public access road into the adjacent community of King Salmon, was threatened. The shoreline configuration of Buhne Spit prior to project implementation is shown in Figure 1. Buhne Drive contains vital utility and sewage lines, and when strong winds coincided with high tides, waves broke onto the roadway disrupting traffic and causing flooding in the homes of King Salmon.

The purpose of the project was to design and construct a state-of-the-art shore protection project to protect Buhne Drive from further damage due to winter storms. Specifically, the project entailed restoring the badly eroded Buhne Spit to its historical 1955 shoreline configuration, and providing structures to maintain the configuration. The project was comprised of four phases and a monitoring program.

Phase I was designed by the County of Humboldt, the U.S. Army Corps of Engineers, and the State Department of Boating and Waterways. Phase I consisted of a 1,250-foot-long timber groin and a 200-foot-long rubble-mound head. The timber groin was designed to stabilize the Phase II sandfill and to prevent the material from being transported downcoast into Field's Landing Channel. Phase I was completed in December, 1983.

Phase II consisted of restoring the sand spit by hydraulic dredging. The borrow areas were located inside Humboldt Bay just north of and adjacent to the Middle Ground Channel. Approximately 600,000 cubic yards of material were dredged forming a fill of almost 24 acres. The Phase II sandfill was designed to provide the actual protection of Buhne Drive. Phase II was completed May, 1984.

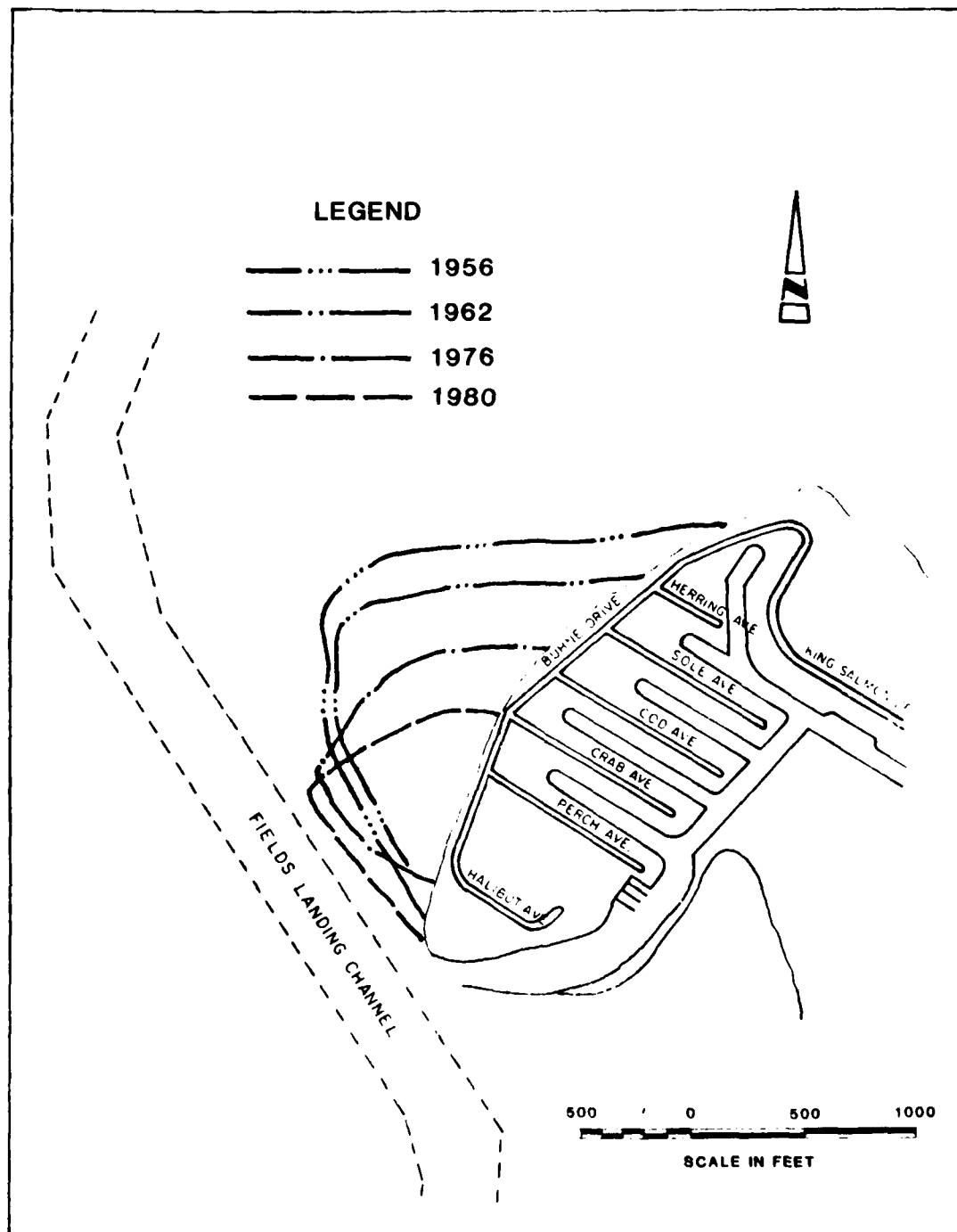


Figure 1. Pre-Project Configuration

Phase III consisted of constructing a 1,050-foot shore-connected rubble-mound breakwater, extending the rubble-mound head of the Phase I timber groin by 425 feet, and rock reveting the Phase I groin. Four model studies, two physical and two numerical, were used to test the proposed design and develop the alignments of the Phase III structures. The model studies were conducted at the Waterways Experiment Station (WES) in Vicksburg, Mississippi. The Phase III structures were designed to shelter and stabilize the sandfill on a long term basis. The selected Phase III plan was tested using a fixed bed physical model using coal tracer to represent the replenished Phase II fill. The plan was subjected to various wave conditions and tides. The tests indicated that:

1. Sediment in the lee of the breakwater remained stable,
2. Erosion occurred in the wider fill area exposed to waves,
3. Material moved easterly behind breakwater and westerly behind groin,
4. Material remained in fill, but finer coal material moved seaward.

Phase III was completed in March 1985. Figure 2 shows the project plan as constructed.

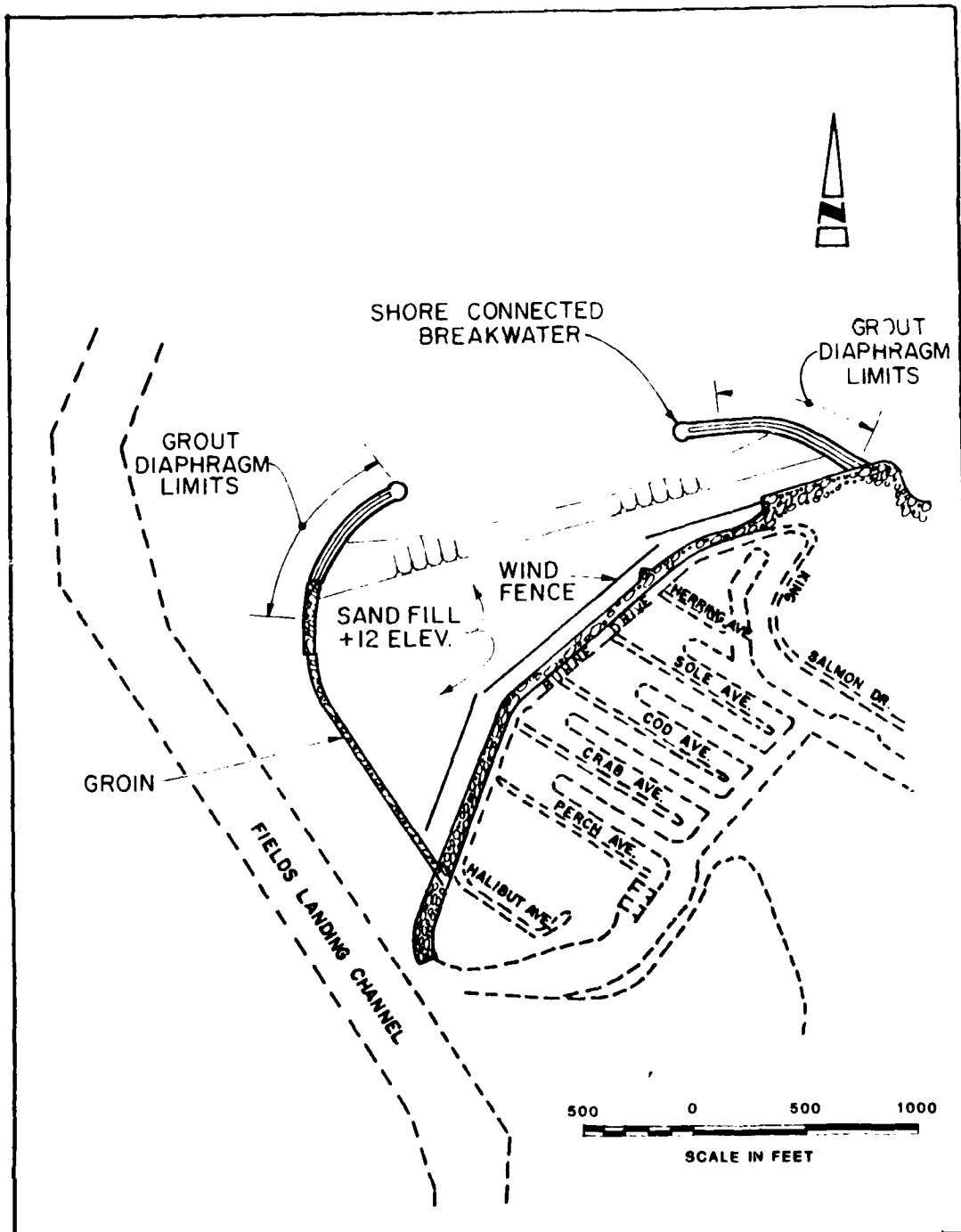


Figure 2. Final Project Plan

## PHYSICAL MONITORING PROGRAM

The physical monitoring program was initiated in September 1984 to document the performance of the project through the first two years of its effective life. The program was designed to consist of biannual hydrographic surveys of the replenished spit offshore area and Fields Landing Channel, aerial topographic surveys and soils samplings. In addition, littoral environment observations (LEO) were conducted to provide qualitative data on the nearshore littoral processes at the project. This monitoring data augmented with data collected during construction form the data base for the analyses in this report.

A summary of the monitoring episodes and construction phases is shown in Figure 3. The topographic surveys were compiled from stereo aerial photographs. The photographs are shown in Appendix A. The survey coverage of the beach face varied because the aerial surveys were flown at different tide levels.

The hydrographic surveys were conducted offshore of the spit and in Fields Landing Channel using a fathometer. The hydrographic surveys of the offshore spit area extended from the shoreline (-3' MLLW to 0 MLLW depending on tide) offshore approximately 1500 feet. The hydrographic surveys of Field's Landing Channel covered the width of the channel and in some instances, extended beyond the channel limits to the groin.

The hydrographic and topographic surveys for Fields Landing and the offshore area were digitized and plotted for calculation of volume changes. The plots of the profiles of the spit and offshore of the spit are shown in Appendix B. The profiles are not continuous in the zone between approximately +4 to -2 feet MLLW because of the varying tide level and the methods used to obtain the elevation data. Profiles were not conducted in the nearshore area between the sandfill and the offshore area to tie in the topographic and hydrographic surveys. The Fields Landing Channel profiles are shown in Appendix C.

One year of LEO data was collected using students from Humboldt State University under contract with the San Francisco District, Corps of Engineers.

ITEM	1983												1984												1985												1986															
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12				
PROJECT CONSTRUCTION	PHASE I												PHASE II												PHASE III																											
AERIAL TOPOGRAPHY SURVEY																																																				
SPIT HYDROGRAPHIC SURVEY																																																				
FIELDS LANDING CHANNEL SURVEY																																																				
SAND SAMPLING																																																				
LITTORAL ENVIRONMENT OBSERVATION																																																				

Figure 3. Summary Of Buhne Point Monitoring Episodes

The data was analyzed by the Corps of Engineers Coastal Engineering Research Center (CERC).

Shallow surface sand samples were collected from the sandfill, offshore of the sandfill, the channel side of the groin and the seaward side of the breakwater. Sand samples were also obtained by rotary drill to determine the pre-project foundation conditions and to locate a borrow source for the sand fill. Mechanical analyses were performed on all the samples by the Corps of Engineers, South Pacific Division Lab. The sampling locations and mechanical analyses results were summarized as a soils appendix by the Los Angeles District. This report is in Appendix D.

## VOLUME CHANGES

Changes in sediment volumes were investigated in the area offshore and on the replenished spit, and in Fields Landing Channel. A base line and stationing system established by the Corps of Engineers was used for the analyses and is shown in Figure 4.

### Buhne Spit

Volume changes at the shoreline of the replenished spit were investigated to document the response of the spit to wave processes. The topographic surveys were analyzed for changes in the foreshore zone within the rubble mound structures and the spit baseline. The topographic surveys covered the spit foreshore seaward to the +2-foot MLLW contour to +6-foot MLLW contour depending on the tide at the time of the survey. Since no wading profiles were conducted, the analyses of the foreshore area are restricted to the topographic data.

Movement of the +2-, +6-, and +10-foot MLLW contours on the spit beach face are shown in Figures 5, 6, and 7, respectively. The contours show a general retreat landward in the exposed center of the beachfill and a general area of accretion behind each of the structures. This is particularly evident in the +2-foot and +6-foot MLLW contours. The +6-foot MLLW contour (approximately the mean high water level) has receded 40 feet at the center of the beachfill between April 1985 and November 1986. The +6-foot MLLW contour has accreted 70 feet and 100 feet behind the groin and breakwater respectively during the same period.

Volumetric analyses were conducted to estimate the quantity of sediment movement in the foreshore area of the spit. Of the five surveys taken after the sandfill was graded, three surveys (April 1985, May 1986 and November 1986) provided coverage to the +2-foot MLLW contour and the remaining two surveys (October 1985 and November 1985) provided coverage to the +6-foot MLLW contour. Volume calculations indicate that between April 1985 and November 1986, the area between the baseline and the +2-foot MLLW contour has experienced a net loss of 7,000 cubic yards. The net loss is comprised of a loss of 13,000 cubic yards from the center of the spit (between stations 5+50 to 13+50) and a gain of 6,000 cubic yards behind the breakwater and groin. A



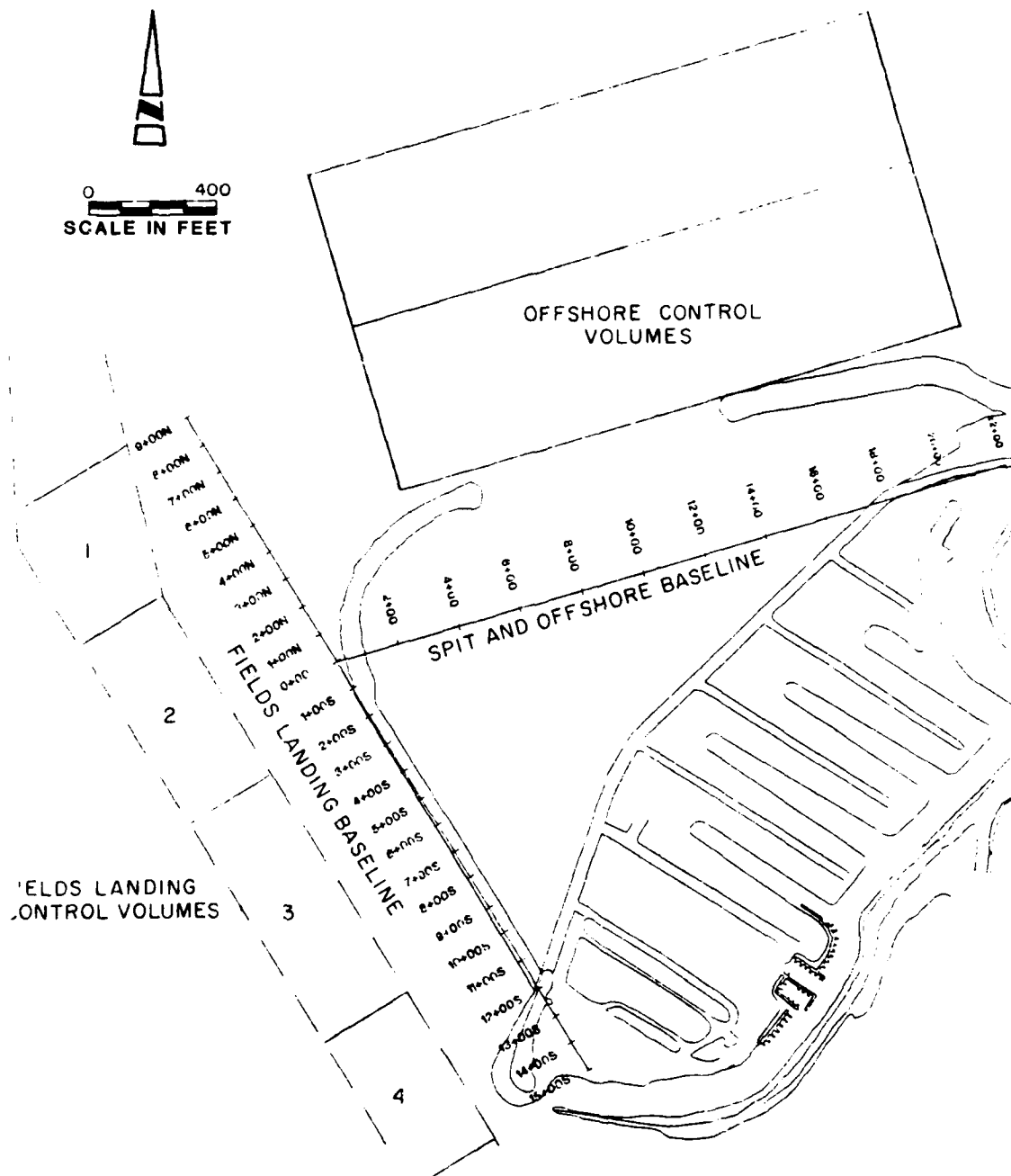


Figure 4. Survey Baselines & Control Volumes

summary of the volume calculations is shown in Table 1. The losses in the center of the sandfill occurred as a general retreat of all the contours (+10-foot to +2-foot MLLW). During this period, the center of the sandfill retreated while maintaining a constant slope of approximately 10 Horizontal to 1 Vertical. The sandfill behind the structures has flattened to a slope of approximately 50 Horizontal to 1 Vertical.

Table 1. Summary of Volume Changes-Buhne Spit Foreshore Area\*  
(cubic yards)

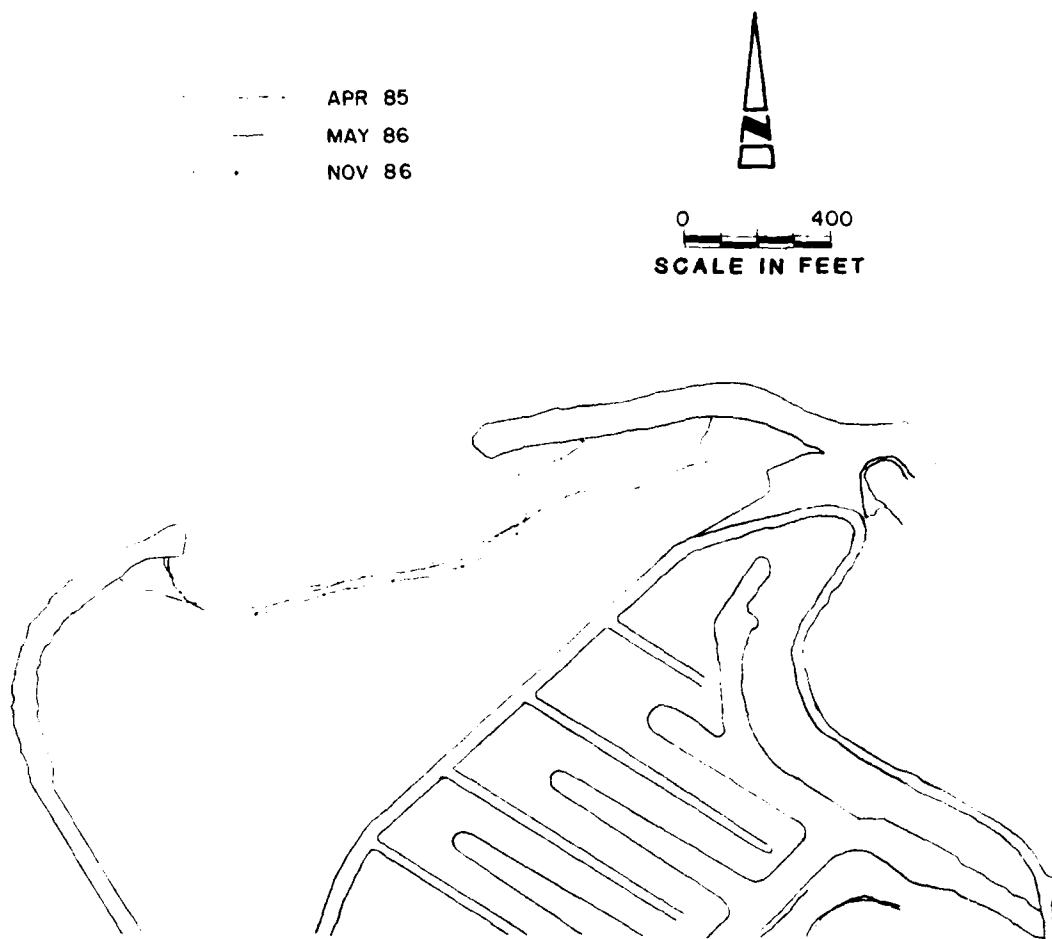
	April 1985 to May 1986	May 1986 to November 1986	NET
Behind Groin STA 1+50 to 5+50	+1,500	-500	+1,000
Middle Area STA 5+50 to 13+50	-6,000	-7,000	-13,000
Behind Breakwater STA 13+56 to 21+50	+6,000	-1,000	+5,000
NET	+1,500	-8,500	-7,000

\*Area Covers Baseline To The +2' MLLW Contour.

#### Fields Landing Channel

An analysis of sediment volumes and shoaling rates in Fields Landing Channel was conducted to evaluate the effects of the project on channel maintenance. A control volume consisting of the channel limits adjacent to the project was used to calculate volume changes. The channel control volume was subdivided into four volumes as shown in Figure 4.

The initial May 1981 hydrographic survey was chosen as a baseline. Subsequent surveys were compared in chronological order with the reference May 1981 baseline survey. Erosion or accretion was quantified as a relative change in channel bottom elevation. The relative depth change was then converted to an "averaged" volume change by multiplying the depth change by the tributary grid point area. The rate of volume change was quantified by the change in average depth along a given range line per unit time.



**Figure 5. Movement Of +2-Foot MLLW Contour**

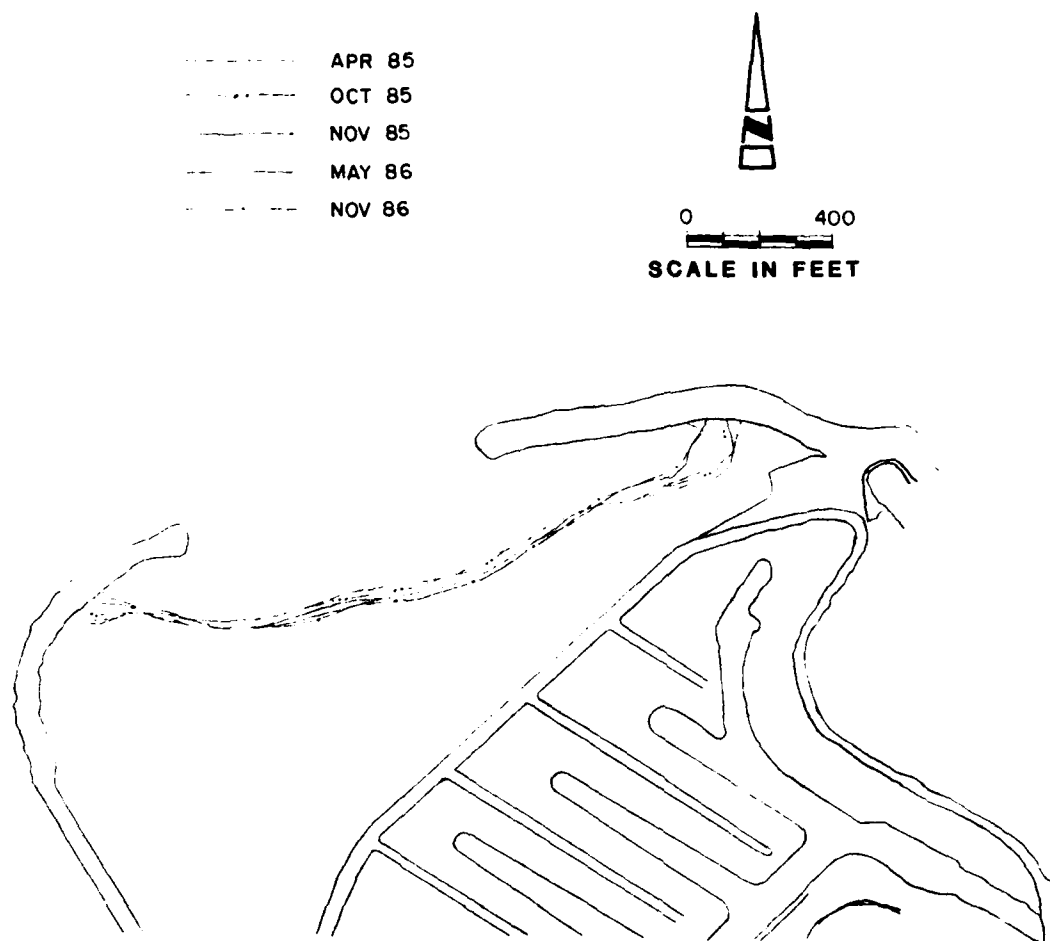
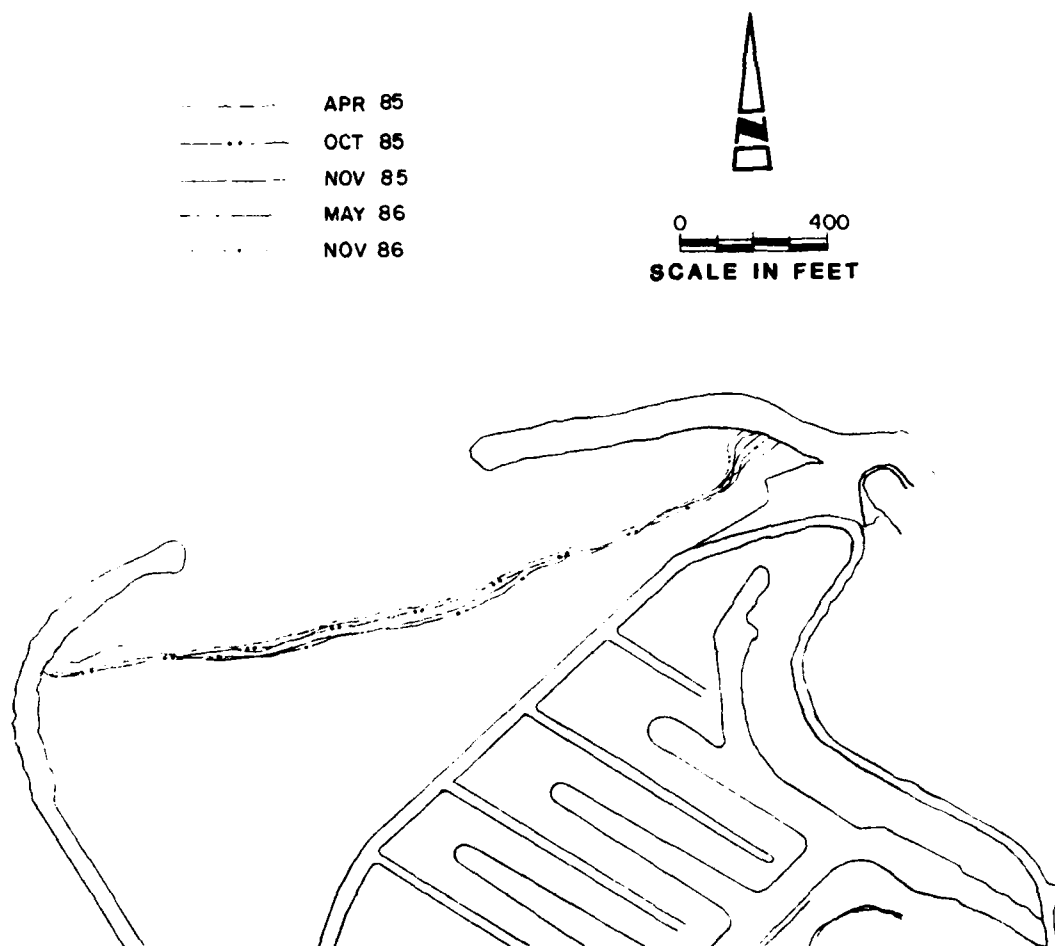


Figure 6. Movement Of +6-Foot MLLW Contour



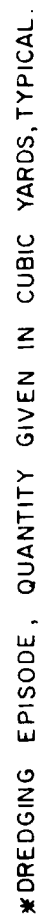
**Figure 7. Movement Of +10-Foot MLLW Contour**

Figure 8 shows the results of the Fields Landing Channel volume change analysis. This figure shows the volume change in the channel relative to the initial May 1981 hydrographic survey. Figure 9 shows the rate of volume change, or rate of sedimentation, into and out of the channel.

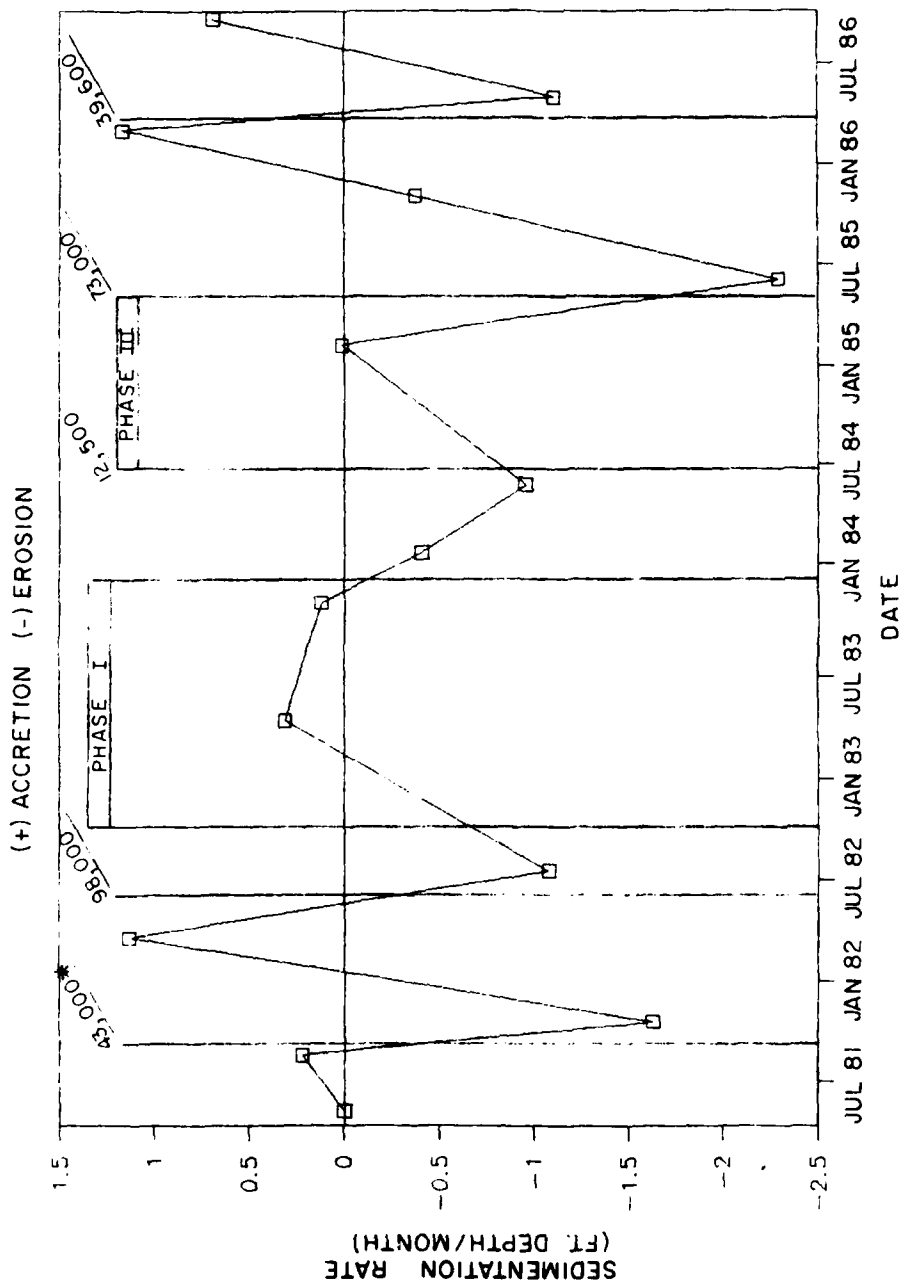
Figure 8 illustrates a general reduction in sediment volumes in Fields Landing Channel. The periods of highest reduction in volume occur simultaneously with dredging episodes for Fields Landing Channel.

A mild rate of accretion occurred from May to August 1981. The first dredging episode occurred between August and October 1981. During the winter months of October 1981 to March 1982, over 40,000 cubic yards of sediment accreted into the channel. Wave data at the Coquille River Station indicates this was a period of relatively high wave activity. The following months showed general but decreasing accretion until the completion of the Phase I timber groin construction. Between November 1983 and June 1984 there was approximately 40,000 cubic yards of erosion in the channel control volume with no dredging being performed during this period. The following months showed a stable channel volume followed by a significant dredge volume in April-May 1985. Of particular interest are two subsequent periods of accretion. These accretion volumes of approximately 30,000 cubic yards and 20,000 cubic yards occurred during the periods of November 1985 to March 1986 and May 1986 to September 1986, respectively.

This plot indicates the significant reduction of the channel sediment volume by the much larger area under the "erosion" part of the curve. One salient feature previously described are the two periods of accretion from November 1985 to March 1986 and May 1986 to September 1986. The accretion rate of the first period described is almost identical to the accretion rate during October 1981 to March 1982. In order to compare the relative distribution of these accretion volumes, the results presented in Figures 8 and 9 are broken down by the four control volumes are tabulated in Table 2. Investigation of the accretion rate breakdown for the period October, 1981 to March 1982 prior to project construction shows most of the accretion occurred in Control Volume 4. This is consistent with the location of the spit prior to construction, as shown in Figure 1 which represents the historical erosion of Buhne Spit from 1956 through 1980. The accretion during the period November 1985 to March 1986 was more evenly distributed over Control Volumes 2 through 4. Comparison



**Figure 8-Fields Landing Channel - Volume Change**



\* DREDGING EPISODE, QUANTITY GIVEN IN CUBIC YARDS, TYPICAL

Figure 9. Fields Landing Channel - Sedimentation Rate



TABLE 2. FIELDS LANDING CHANNEL - VOLUME CHANGES AND SEDIMENTATION RATES

PERIOD	5/81	8/81	10/81	3/82	7/82	4/83	7/82	4/83	11/83	2/84	6/84	2/85	6/85	11/85	3/86	11/85	3/86	5/86	9/86
CONTROL VOLUME	8/81	10/81	3/82	7/82	4/83	11/83	2/84	6/84	2/85	6/85	11/85	3/86	5/86	9/86					
1	-----	-----	3067	4733	9720	11340	-1020	480	-7440	-7980	-5280	-660	-4260	-----					
2	-2811	-10189	-5794	-14906	172	-3483	-428	-8677	-4006	-22183	-28806	-20183	-24122	-14033					
3	-1689	-24800	-17920	-34800	-22720	-20960	-22880	-36480	-32640	-70160	-77920	-71222	-81600	-80000					
4	8580	10620	34980	24180	15600	21540	23580	12540	14100	-1080	-5160	4500	3780	5940					
1	-----	-----	.22	.06	.08	.03	-.56	.05	-.14	-.2	.07	.16	-.25	-----					
2	-.12	-.46	.11	-.33	.23	-.06	.13	-.28	.07	-.62	-.18	.03	-.26	.33					
3	-.06	-1.2	.14	-.43	.13	.03	-0.7	-.35	-.05	-.95	-.16	.38	-.55	.04					
4	.4	.14	.66	-.38	-.13	.12	.09	-.38	.03	-.52	-.11	.33	-.05	.08					

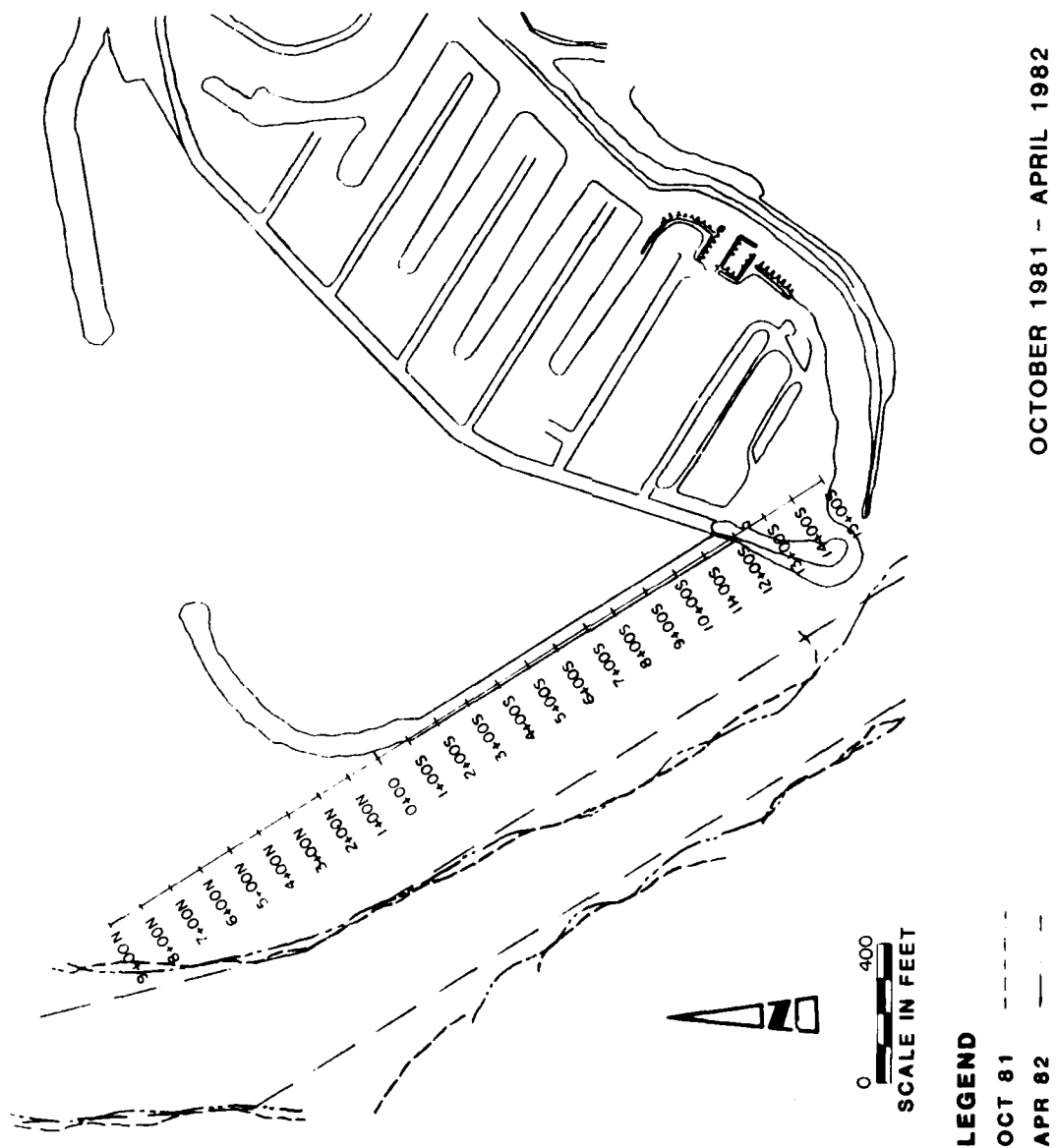
of hydrographic survey data prior to and after this accretion period showed the accretion to be somewhat evenly distributed, with a greater amount accreting on the eastern side of the channel.

The other period of sediment accretion subsequent to the project construction during the period May 1986 to September 1986 occurred primarily in Control Volume 2. Investigation of the hydrographic survey data prior to and after this period indicated most of the accretion occurred within 60 to 90 feet of the eastern bank of the channel. Depth decreases of ten feet and greater were not uncommon in this localized area.

The movement of the -25-foot and -30-foot MLLW contours between dredging episodes was investigated to determine the effect of the project on shoaling patterns in Fields Landing Channel. Figures 10 and 11 illustrate the movement of the -25-foot and -30-foot MLLW contours between a dredging cycle between October 1981 and April 1982, before project implementation. Figures 12 and 13 illustrate movement of the -25-foot and -30-foot MLLW contours between a dredging cycle between July 1985 and April 1986, after completion of the project.

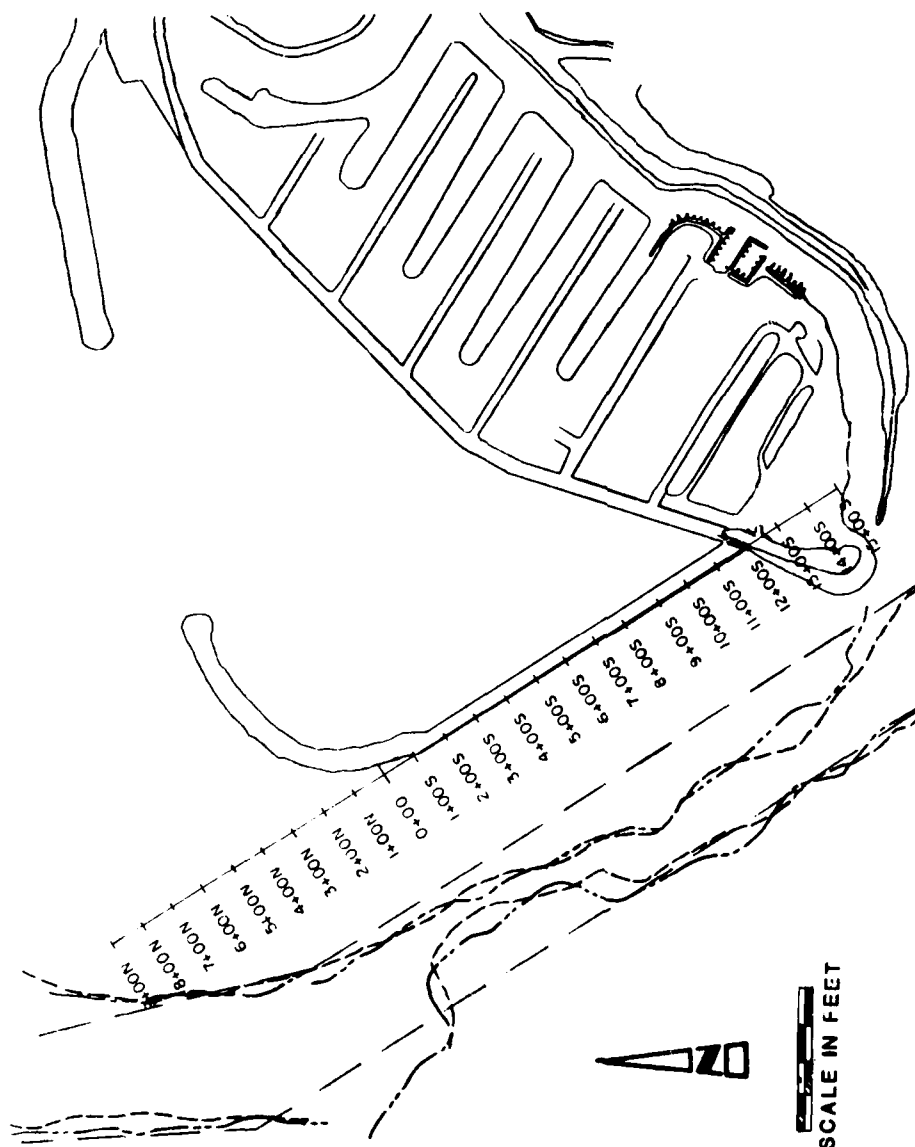
Comparison of the shoaling patterns from the two dredging cycles indicate:

1. The general patterns of contour movement appear similar in location between both episodes.
2. Movements of both the -25-foot and -30-foot MLLW contours are greater in magnitude in the October 1981 to April 1982 episode than those for the July 1985 to April 1986 episode.
3. Movement of the -30-foot MLLW contour is prevalent on the west edge of the channel from Station 2+00N to 3+00S and Station 9+00N to Station 11+00N. Movement on the east edge is prevalent from Station 0+00 to 14+00S. The movement of the -30-foot MLLW contour from the west between Stations 2+00N and 3+00S is the most pronounced.
4. Movement of the -25-foot MLLW contour is prevalent along the east edge from Station 2+00S to Station 14+00S.



OCTOBER 1981 - APRIL 1982

Figure 10. Movement Of -25-Foot MLLW Contour



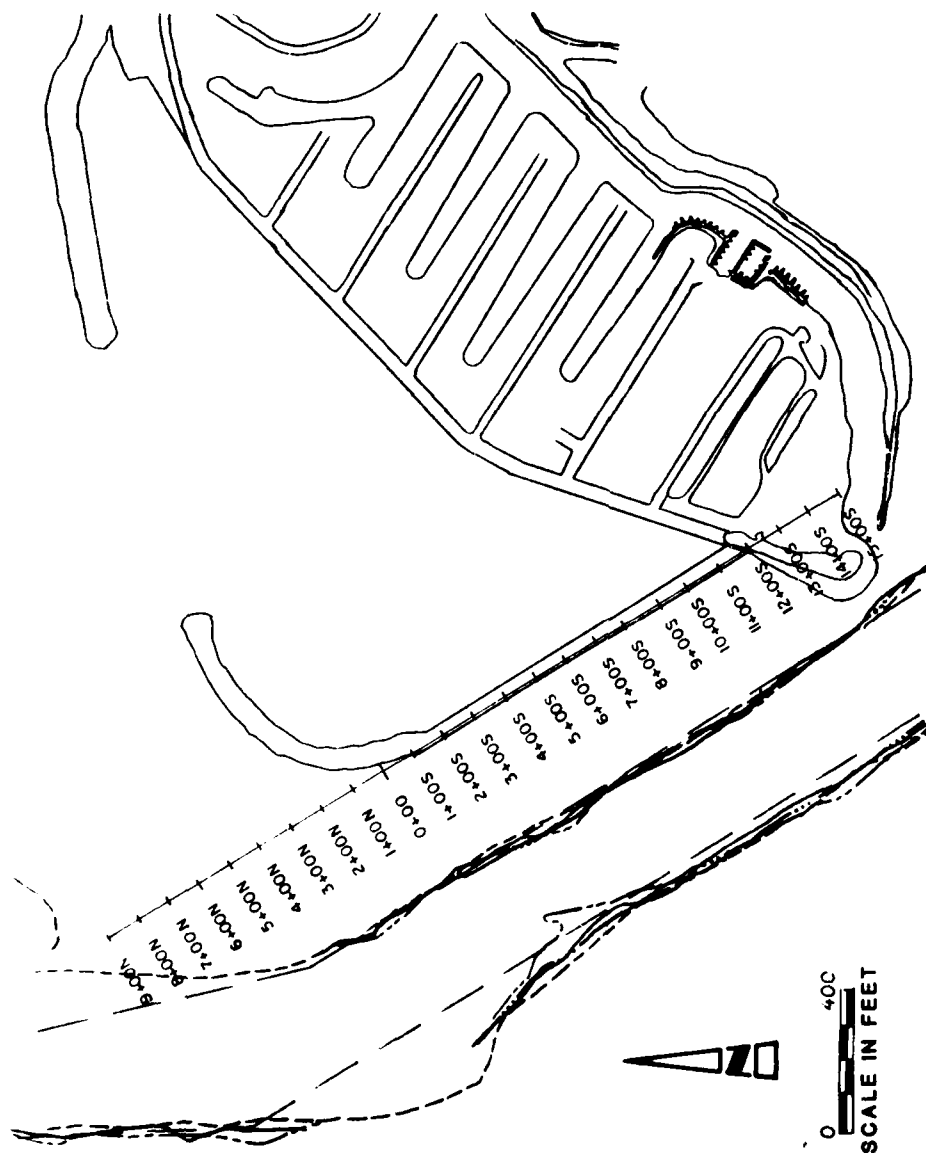
# LEGEND

OCT 81

APR 82

OCTOBER 1981 - APRIL 1982

Figure 11. Movement Of -30-Foot MLLW Contour



JULY 1985 - APRIL 1986

Figure 12. Movement Of -25-Foot MLLW Contour

# LEGEND

JUL 85

NOV 85

DEC 85

APR 86



### Offshore Area

Volume changes in the area offshore the sand fill were calculated between nine hydrographic surveys taken between April 1983 and September 1986. Comparison of profiles from survey dates yielded accretion and erosion areas. Two zones were used for determination of volume changes offshore: one zone was bound by offsets +450 feet and +1000 feet from the spit baseline; the second zone was from offset +1000 feet to +1500 feet from the spit baseline.

Figure 14 shows volume changes for each time period based on the April 1983 survey. For the period between April 1983 and February 1984, net volume change for both offshore areas was approximately 7000 cubic yards of erosion combined. Between February 1984 and May 1984, net volume change for the offshore areas was approximately 78,000 cubic yards of erosion. For the period between May 1984 and February 1985, net volume change for the areas was 55,000 cubic yards of accretion. For the period between February 1985 and October 1985, net volume change for the areas was 40,000 cubic yards of erosion.

Volume change for the period between October 1985 and November 1985 was 55,000 cubic yards of erosion. Review of recorded wave buoy data (see WAVE DATA Section) and the recorded LEO data indicate that there was a period of high wave activity during October 1985. Volume change for the period between November 1985 to May 1986 was 10,000 cubic yards of deposition while the period between April 1986 to August 1986 was 50,000 cubic yards of erosion.

Trend of the volume changes offshore appears to be erosional. Average elevation change for the control area was -1.0 foot from April 1983 to September 1986. This is considered minor considering the flat offshore area and the survey methods involved. There was not a significant difference in the behavior of the two offshore areas. Both areas experienced erosion and deposition simultaneously. It appears that transport processes are similar in both the offshore areas.

Figure 14

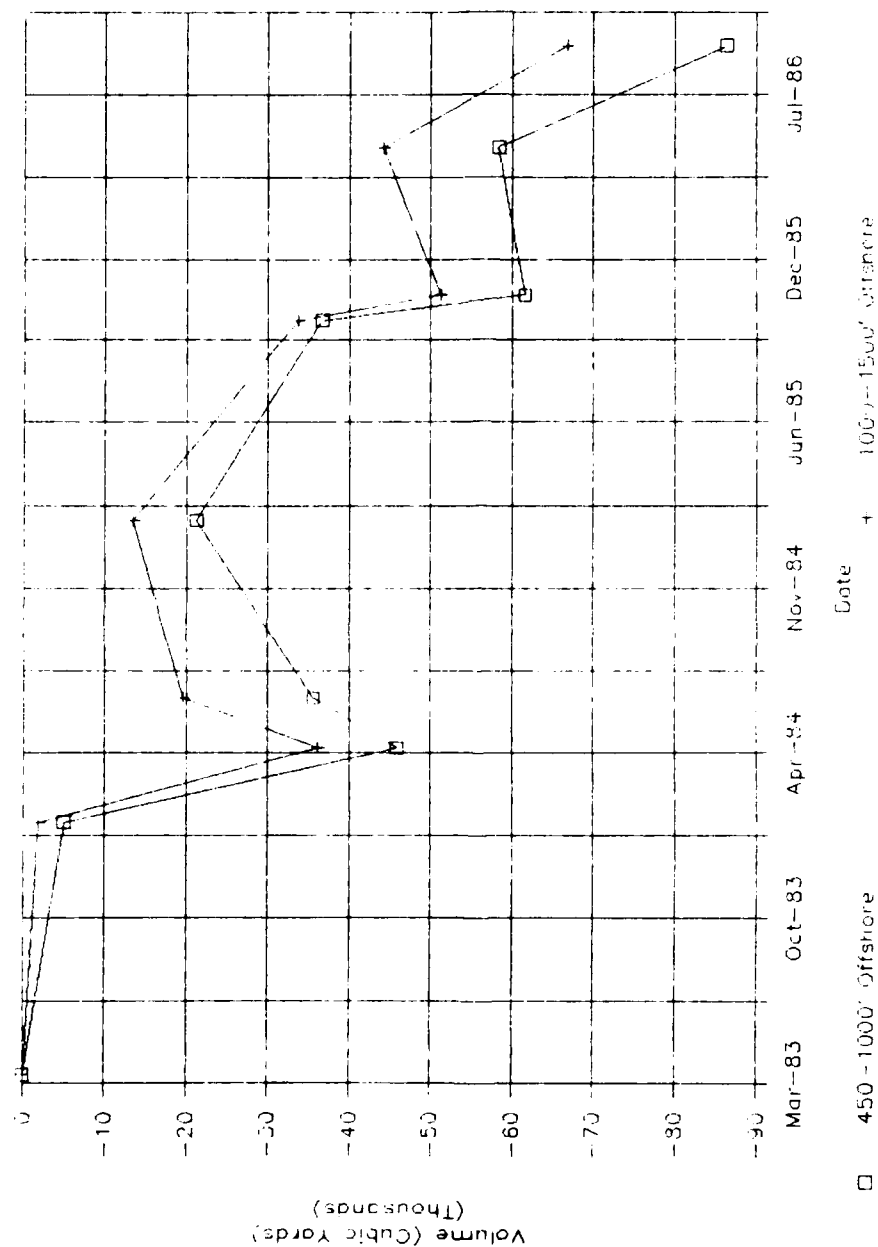


Figure 14. Offshore Volume Changes



#### WAVE DATA

The Coastal Data Information Program, sponsored by the Corps of Engineers and The California Department of Boating and Waterways, operated a wave buoy inside Humboldt Bay intermittently from March 1980 to September 1982. A qualitative comparison of the wave data from Humboldt Bay and the nearest wave buoy (160 miles) operating concurrently with the Humboldt Bay Buoy during the monitoring period was made. The comparison indicated that large wave events recorded at the Coquille River (Oregon) Outer Buoy were also recorded at the inner Humboldt Bay Buoy. The buoy at Coquille River therefore gives a qualitative indication of when storm events occur in the northern California/Oregon area. This correlation was qualitative, no transference of wave characteristics from the Coquille River Buoy to Humboldt was attempted. A summary of the data from the Coquille River Buoy is shown in Figures 15, 16 and 17.

Additional wave observations at the project site were obtained from the Littoral Environment Observation program.

COQUILLE RIVER, OR BUOY AUG-DEC 1984

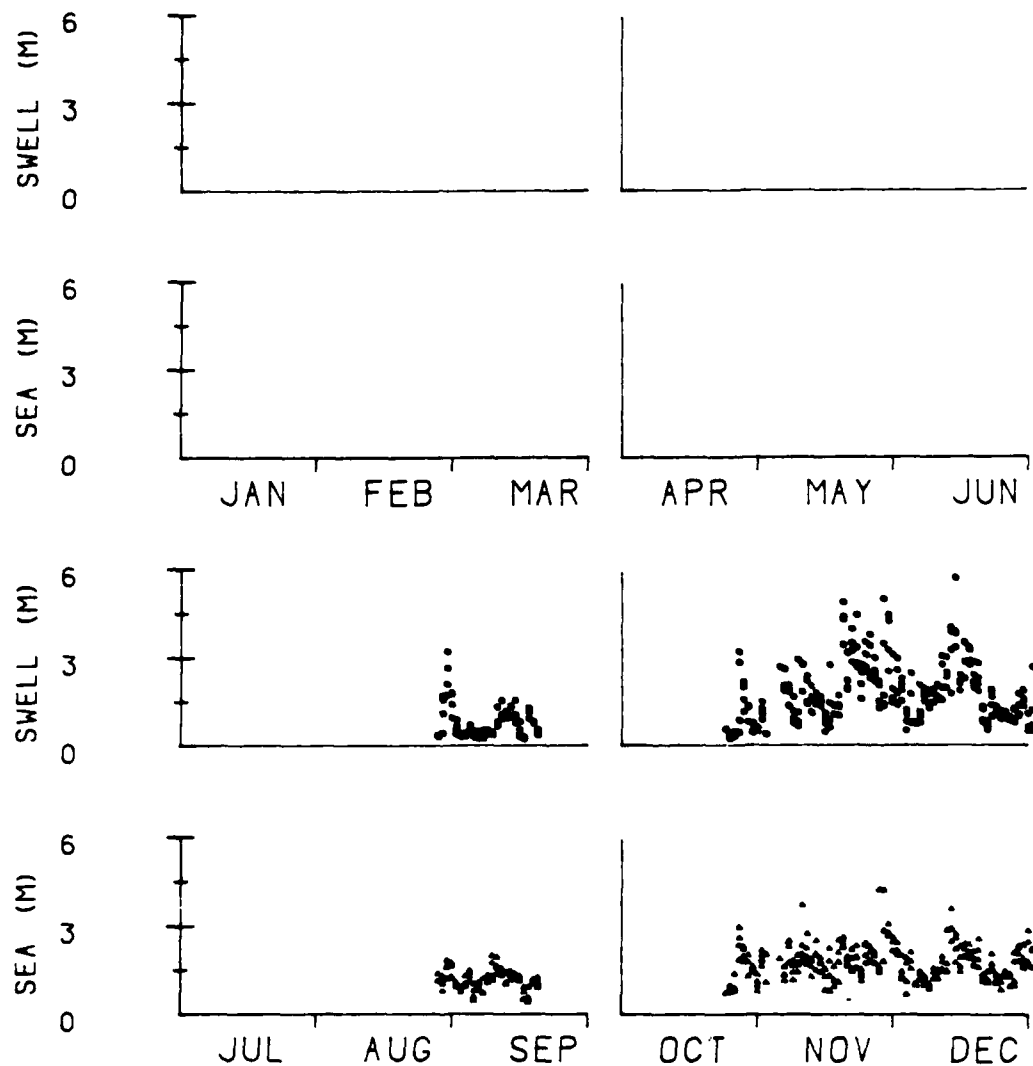


Figure 15. Significant Heights Of Sea & Swell  
(From Coastal Data Information Program, 1984)

# COQUILLE RIVER, OR BUOY JAN-DEC 1985

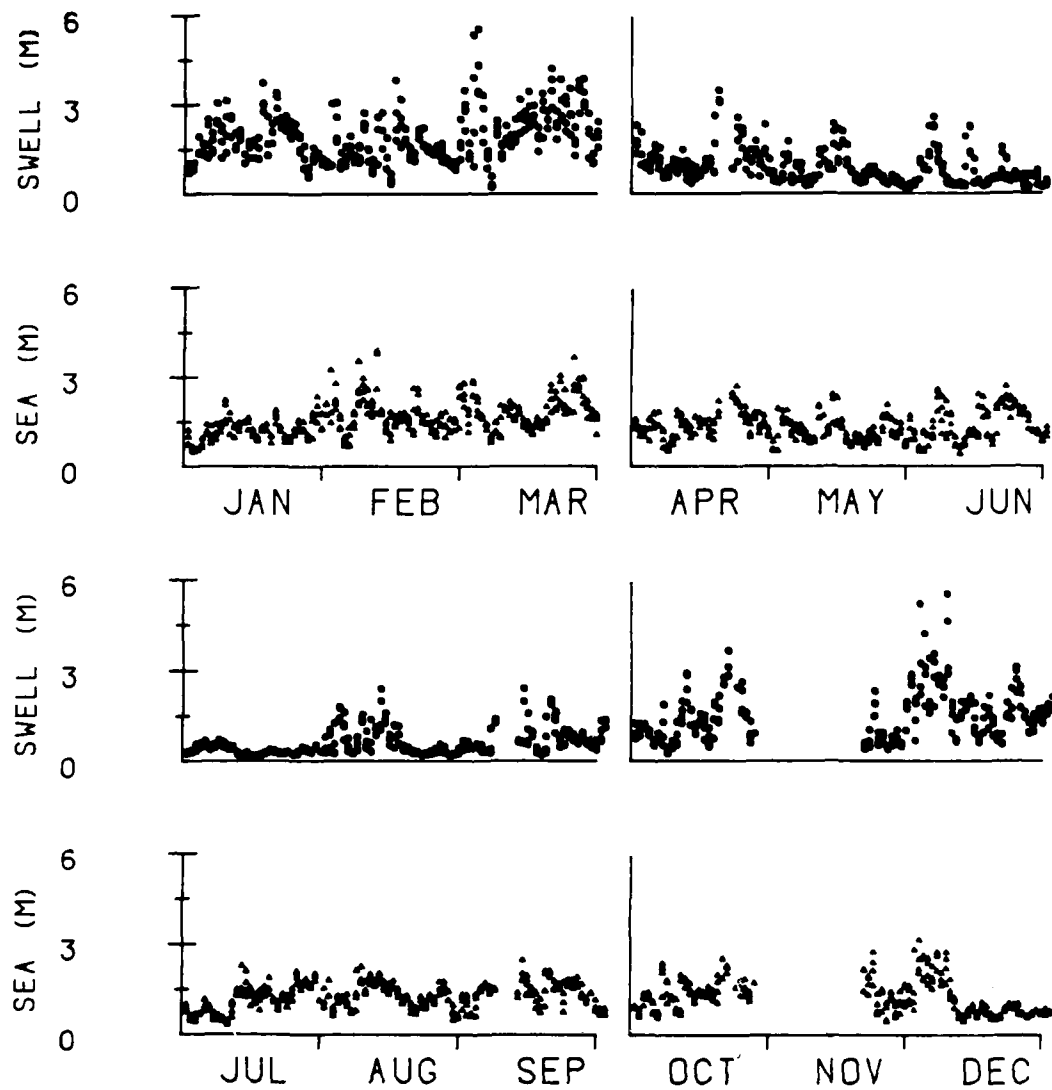


Figure 16. Significant Heights Of Sea & Swell  
(From Coastal Data Information Program, 1985)

# COQUILLE RIVER, OR BUOY JAN-OCT 1986

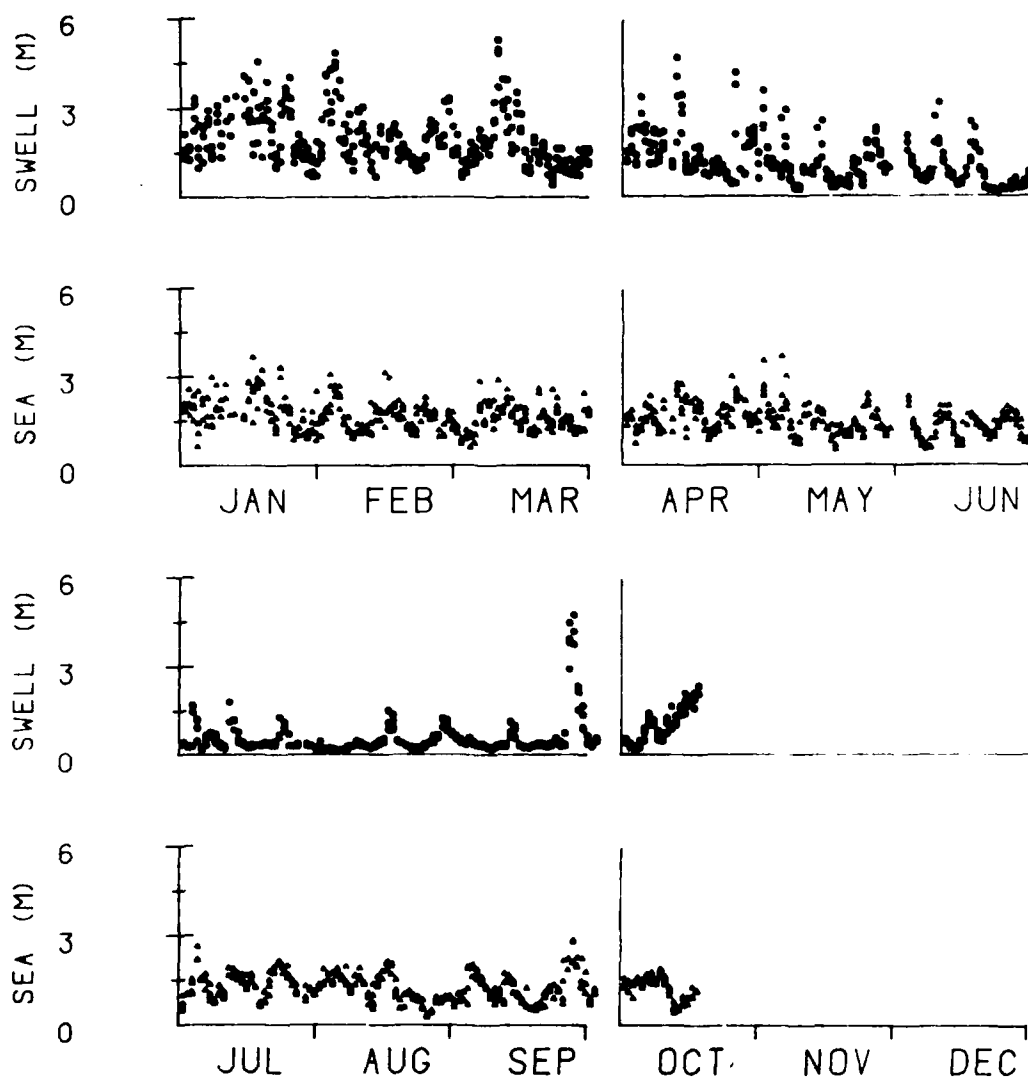


Figure 17. Significant Heights Of Sea & Swell  
(From Coastal Data Information Program, 1986)

### LITTORAL ENVIRONMENT OBSERVATIONS (LEO)

A LEO station was established in April 1985 to provide a low cost method for obtaining data on coastal processes at Buhne Point. The station was located on Buhne Spit at the approximate center of the shoreline of the beachfill. The LEO observations yield information for littoral sand transport evaluation at Buhne Point where otherwise no data exist.

Observations were made by contract personnel who were instructed on observation techniques by the Los Angeles District. Equipment for the observations were provided by the Information and Analysis Center, Coastal Engineering Research Center (CERC). Duration of the collection period was twelve months, from 1 April 1985 to 31 March 1986. The twelve month collection of LEO data would be insufficient for application to quantitative engineering studies of the coastal processes at Buhne Point. The data are, however, considered adequate for qualitative evaluations of the project performance. Observations in a continuous time series of more than one year would tend to smooth out the random variations in the data, thus providing a better description of the coastal processes at the site.

Daily observations of estimates of breaker height and period, direction and type of breaking waves, local winds, littoral currents and foreshore slope are recorded on forms designed for the program. In addition, the LEO observers plotted the approximate shoreline configuration of the replenished spit during each observation. At the conclusion of the twelve month period, CERC provided a printout of the data to Los Angeles District. A summary of the analyses are shown in Table 3.

#### Waves and Wave Periods

With the twelve month sample available, the average wave heights at the LEO station ranged from 1.22 (March 1985) to .40 feet (August 1985). The highest reported wave was 3.3 feet and occurred on June 20 1985. The average observed wave period ranged from 2.8 (May 1985) to 6.0 seconds (September 1985). The longest wave period observed was 11.7 seconds and was observed in September 1985. Wave heights from 1 to 3 feet occurred about 31 percent of the time during the twelve month period. Wave heights exceeded 3.0 feet 1.2 percent of

Table 3. Summary of LEO Station 05185 Data From April 1985 to March 1986

	April	May	June	July	August	September
<b>Surf Observations</b>						
Highest Wave Recorded (ft.)	20.	20.	19.	20.	20.	21.
Average Wave Height (ft.)	1.70	1.50	3.30	1.60	1.10	1.00
Longest Wave Period (sec.)	.83	.68	.87	.56	.40	.55
Average Wave Period (sec.)	8.50	4.70	6.00	4.80	6.10	11.70
Average Wave Width (ft.)	4.62	2.81	4.22	3.63	3.38	5.98
	23	5	19	10	10	5
<b>Wind Observations</b>						
Highest Wind Recorded (MPH)	10.0	12.0	10.0	11.0	12.0	12.0
Average Wind Speed (MPH)	3.8	6.4	4.1	4.5	5.1	5.3
Percent Occurrence from						
North	5.0	30.0	.0	.0	5.0	42.9
Northeast	5.0	5.0	5.0	.0	.0	4.8
East	10.0	.0	.0	.0	.0	.0
Southeast	10.0	.0	5.0	.0	.0	.0
South	.0	5.0	5.0	5.0	.0	.0
Southwest	.0	10.0	25.0	35.0	25.0	9.5
West	.0	.0	.0	.0	.0	28.6
Northwest	40.0	40.0	45.0	35.0	65.0	14.3
Calm	30.0	10.0	15.0	25.0	5.0	.0
<b>Current Observations</b>						
Ave. to Left (fps)	-.14	-.11	-.29	-.05	-.07	-.22
Ave. to Right (fps)	.12	.20	.16	.21	.16	.12
Ave. Net Current (fps)	.00	.09	-.03	.12	.09	-.06
Ave. Foreslope Slope (Z)	5.0	7.2	6.1	6.4	8.2	7.6
<b>Sediment Transport</b>						
Method 1						
Total Left cu. yd.	-4345.	-2972.	-18373.	-757.	-502.	-231.
Total Right cu. yd.	2360.	7.	4795.	2018.	320.	22.
Net cu. yd.	-1985.	-2965.	-13578.	1261.	-182.	-209.
Method 2						
Total Left cu. yd.	-443.	-31.	-1907.	-50.	-36.	-58.
Total Right cu. yd.	235.	61.	268.	268.	51.	19.
Net cu. yd.	-208.	30.	-1639.	218.	15.	-39.

\*Minus values indicate downcoast (southwesterly) transport potential

Table 3 (cont.). Summary of LEO Station 05185 Data From April 1985 to March 1986

	October	November	December	January	February	March	Total
<b>Surf Observations</b>							
Highest Wave Recorded (ft.)	19.	18.	20.	20.	20.	19.	236
Average Wave Height (ft.)	1.00	2.00	3.00	2.00	3.10	2.50	2.10
Longest Wave Period (sec.)	.59	.98	.80	.99	1.00	1.22	1.22
Average Wave Period (sec.)	6.20	10.00	7.70	8.00	6.30	7.20	11.70
Average Wave Width (ft.)	4.24	4.58	4.14	5.33	4.39	4.76	5.98
	15.	9.	20.	16.	17.	17.	23.
<b>Wind Observations</b>							
Highest Wind Recorded (MPH)	12.0	14.0	9.0	10.0	14.0	17.0	17.0
Average Wind Speed (MPH)	4.7	6.0	3.6	3.8	6.3	8.6	8.6
Percent Occurrence from							
North	.0	45.0	.0	15.0	5.0	31.6	15.0
Northeast	20.0	5.0	20.0	5.0	.0	.0	5.8
East	5.0	.0	20.0	.0	.0	.0	2.9
Southeast	20.0	.0	5.0	15.0	10.0	10.5	6.3
South	5.0	5.0	.0	10.0	25.0	21.1	6.8
Southeast	5.0	5.0	10.0	30.0	25.0	21.1	16.7
West	.0	.0	.0	.0	5.0	5.3	3.2
Northwest	30.0	25.0	20.0	15.0	20.0	29.1	29.1
Calm	15.0	15.0	25.0	10.0	10.0	10.5	14.2
<b>Current Observations</b>							
Ave. to Left (fps)	-.09	-.16	-.16	.00	-.07	-.14	-.14
Ave. to Right (fps)	.17	.17	.24	.00	.17	.23	.18
Ave. Net Current (fps)	.07	-.01	.08	.00	.14	.15	.06
Ave. Foreslope Slope (%)	8.2	7.4	5.5	5.8	5.4	5.6	6.5
<b>Sediment Transport*</b>							
Method 1							
Total Left cu. yd.	-1633.	-7010.	-11835.	-2833.	-2971.	-4732.	-58,194.
Total Right cu. yd.	1082.	0.	7176.	281.	14820.	430.	33,311.
Net cu. yd.	-551.	-7010.	-4659.	-2552.	11849	-4302.	-24,883.
Method 2							
Total Left cu. yd.	-70.	-285.	-1347.	0.	-36.	-85.	-4348.
Total Right cu. yd.	146.	153.	908.	0.	2119.	544.	4772.
Net cu. yd.	76.	-132.	-439.	0.	2083.	459.	424.

\*Minus values indicate downcoast (southwesterly) transport potential

the time. Wave periods observed were between 2.0 and 5.9 seconds about 84 percent of the time.

#### Winds

The monthly average wind speed observed at the LEO station ranged from 3.6 (December 1985) to 8.6 (March 1986) miles per hour. The highest wind speed observed was 17 miles per hour occurring on March 20, 1986. The dominant directions for winds were from the north and northwest. The winds occurred about 18 percent and 34 percent of the time from the north and northwest directions, respectively.

#### Longshore Currents

As measured with the LEO protractor, wave directions less than 90 degrees produce a positive current (to observer's right) and wave directions greater than 90 degree produce a negative current (to observer's left). The highest monthly average positive current was .24 feet per second and the highest negative current was .29 feet per second. The compiled data indicated that the average net current for the LEO station was to the right (upcoast).

#### Sediment Transport Rates

Two applications of LEO data for predicting the sediment transport were used for the study area. The first method for predicting the sediment transport rate considers the wave breaking at an angle to the shoreline (Energy Flux Method). The method was based on equations 4-38 and 4-50B from the Shore Protection Manual (SPM). A longshore energy flux (equation 4-38) was first calculated for only the days of the month where wave height and angle of approach have been recorded. Then an average flux for each month was calculated. The monthly flux was substituted into equation 4-50B and divided by 12 to get the net monthly sediment transport volumes. The total sediment transport volume was calculated by summing the monthly values.

The second method computes the sand transport based on longshore current velocities. This method was based on equations 4-51, 4-52, and 4-50B from the SPM, using the LEO data for wave height, width of surf zone, longshore



current, distance to dye patch from shoreline. A friction factor of .006, recommended by CERC, was used in equation 4-52.

#### SOILS SAMPLING

Analyses of the sand samples were conducted by the Corps of Engineers and are included in Appendix D. The analyses indicate that the sandfill material landward of the beach slope face has remained essentially the same. The sand on the slope face is somewhat coarser than the original sandfill material. Offshore, the gradations of material tend to show an increase in fine sands. Areas showing the most significant increases in fine sand are located just inside the breakwater and around the head of the groin.

These data indicate that the sand on the spit face is being sorted by wave action. The easier to transport fine grain material is being transported offshore and behind the rubble-mound structures where the material settles in reduced wave action.

#### AEOLIAN TRANSPORT

Topographic contouring, sand fencing and vegetation were used to stabilize the sand spit from wind erosion. Discussions with Corps of Engineers Eureka Resident Office personnel indicate that these measures, particularly vegetation, have greatly reduced blowing sand at King Salmon. Modifications to the spit through the road construction and grading make it difficult to estimate the actual aeolian erosion rate for the project. However, calculations of potential transport were conducted to obtain an idea of the effectiveness of the stabilizing measures.

An analysis of potential transport was conducted using wind data from the Eureka/Arcata Airport. Wind data available from the Pacific Gas and Electric power plant adjacent to Buhne Point was not summarized. Transferring this data to a format usable for this study was beyond the scope of this study. Potential transport for October 1985 was 57 cubic yards. Sand transport was reported during October 1985 at the east end of the project. This area was subsequently sand fenced and vegetated. Sand transport has been reduced from the area.

## SITE INSPECTION

An informal inspection of the project was conducted on 9 and 10 June 1987. Representatives of the Corps of Engineers Eureka Resident Office, California Department of Boating and Waterways and Moffatt and Nichol, Engineers attended.

Both days were overcast with winds from the northwest about 5 to 10 miles per hour. The tide during the inspection on the 9th of June was approximately +3.5 feet ebb and +4 feet flood on the 10th of June. Both days had local seas of about 0.5 feet with swell entering from the Humboldt Bay entrance about 1.0 foot at a period of eight seconds.

### Breakwater

The breakwater appears to be structurally sound. Corps of Engineers personnel indicate that breakwater stones have not been displaced. Small stones, up to approximately 75 pounds, have been displaced from the breakwater crest and are laying on the breakwater backslope and the sand fill. This was prevalent between Station 2+50 to Station 5+00. This material is the remnant of the access road on the crest used for construction of the breakwater and grout diaphragm. Removal of small undersized material by wave action, especially overtopping waves, is to be expected on coastal structures and should be considered normal. The displacement of the construction access road has exposed the top of the drilled grout holes, leaving a small piece of mushroom shaped grout on the crest. The grout diaphragm, in general, appears to be functioning well. The diaphragm was constructed by drilling and grouting the breakwater at 2.5 foot centers along the crest. It was suggested by Corps of Engineers personnel that the use of concrete sheets would have been a better method of placing a concrete diaphragm. It was noted and documented by Corps personnel that the diaphragm is not continuous, especially in the area from Station 4+00 to Station 5+50. Water permeates through the breakwater at high tide levels. There was not, however, evidence of large amounts of sand being removed through the breakwater.

### Groin

The groin also appears structurally sound. The stones are placed well, especially along the timber wall, and show no signs of displacement. No signs of significant sand movement through the groin were observed. The timber wall and filter fabric seem to be performing as designed, although direct inspection is not possible. Along the timber groin, from Station 2+00 to Station 9+00, small sink holes have formed where sand is moving over the top of the timber groin and down into the rock revetment. This will probably not represent significant sand quantity losses.

### Sandfill

The sandfill exhibited many interesting features. The upland area away from the beachface was covered with small shell fragments. It is anticipated that these shells may have some armoring effect on the fill, possibly reducing aeolian transport of the sand. This is only speculation since the vegetation, dunes and fencing are the major features in stabilizing the sand. It was also noted that the concrete wall constructed along Buhne Drive is trapping sand as well as providing a barrier for motor vehicles. The beach area was characterized by a steeply sloped (approximately 8 to 1) face with flatter sloped areas (approximately 30 to 1) sheltered behind the breakwater and groin. The main beach area was composed of medium grain sands while the flat sheltered areas were characterized by fine grain sands. Diffraction of the waves was evident especially behind the breakwater. At the top of the beach face, some deposits of cohesive fine grain material were observed.

## CONCLUSIONS

1. The project appears to be performing as designed. The structures have been stable to date. The replenished spit has experienced minor erosion similar to that shown in the physical model. The project should be inspected biannually to check for major shoreline erosion, displaced stones, sink holes or evidence of sand migration through the groin or breakwater.
2. The spit shoreline appears to be approaching an equilibrium point during low wave activity, with large wave events being the dominant shoreline shaping feature.
3. There appears to have been little material leaving the spit (7,000 cubic yards or 1 percent of the material placed) through wave action. This material is probably transported during large wave events. It is not clear where the material is deposited or if this material returns.
4. The spit material has been sorted by wave action. Large grain sand and steeper slopes is evident on the beach face exposed directly to waves. Fine grain sand and flat slopes are evident behind the structures where diffraction greatly reduces the wave energy.
5. The area offshore of the spit has experienced minor erosion since the project was constructed.
6. Shoaling patterns in Fields Landing Channel have not been greatly modified by the project.
7. The effects of the project on Fields Landing Channel dredging volumes are masked by the uneven dredging cycles and quantities dredged. There was a decrease in shoaling rates during the period that Phase I and II were constructed. This may suggest that the Phase I groin was trapping material moving downcoast that normally would have been deposited in Fields Landing Channel.

8. Efforts to stabilize the spit from wind erosion are functioning well. Vegetation, dunes and sand fences are stabilizing the spit causing a reduction in blowing sand in the community at King Salmon.

APPENDIX A  
AERIAL PHOTOGRAPHS





Figure A-1. March 1984 Aerial.



Figure A-2. August 1984 Aerial.



Figure A-3. April 1985 Aerial.



Figure A-4. October 1985 Aerial.

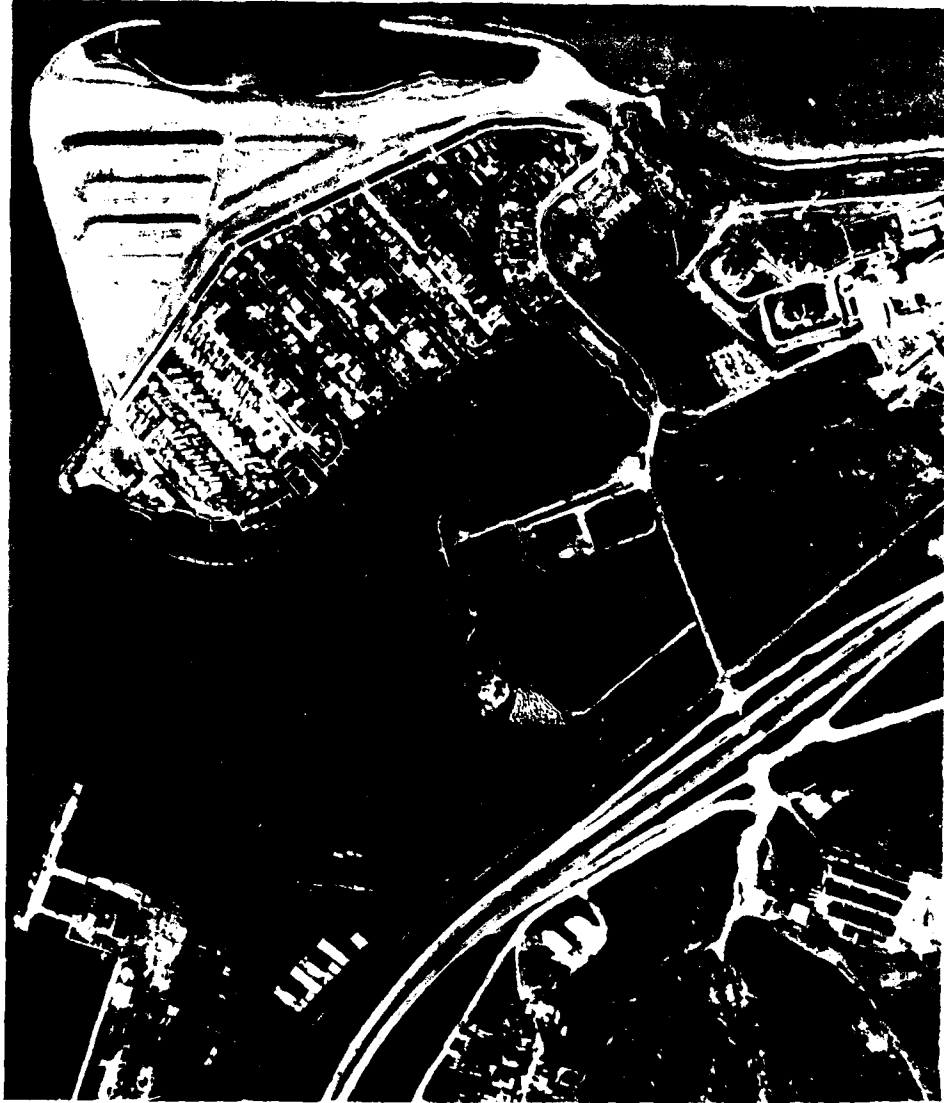


Figure A-5. November 1985 Aerial.



Figure A-6. May 1986 Aerial.



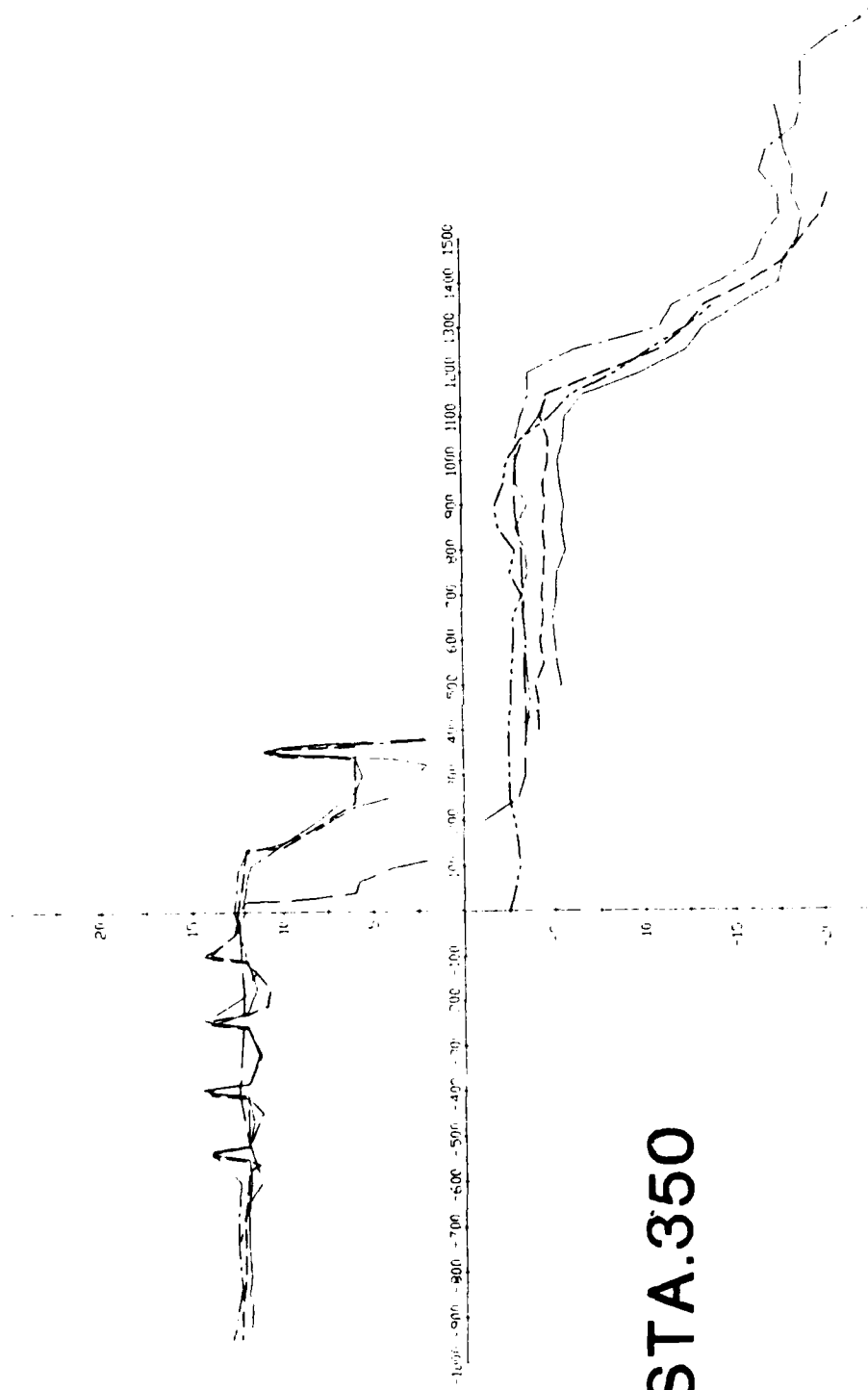
Figure A-7. November 1986 Aerial.

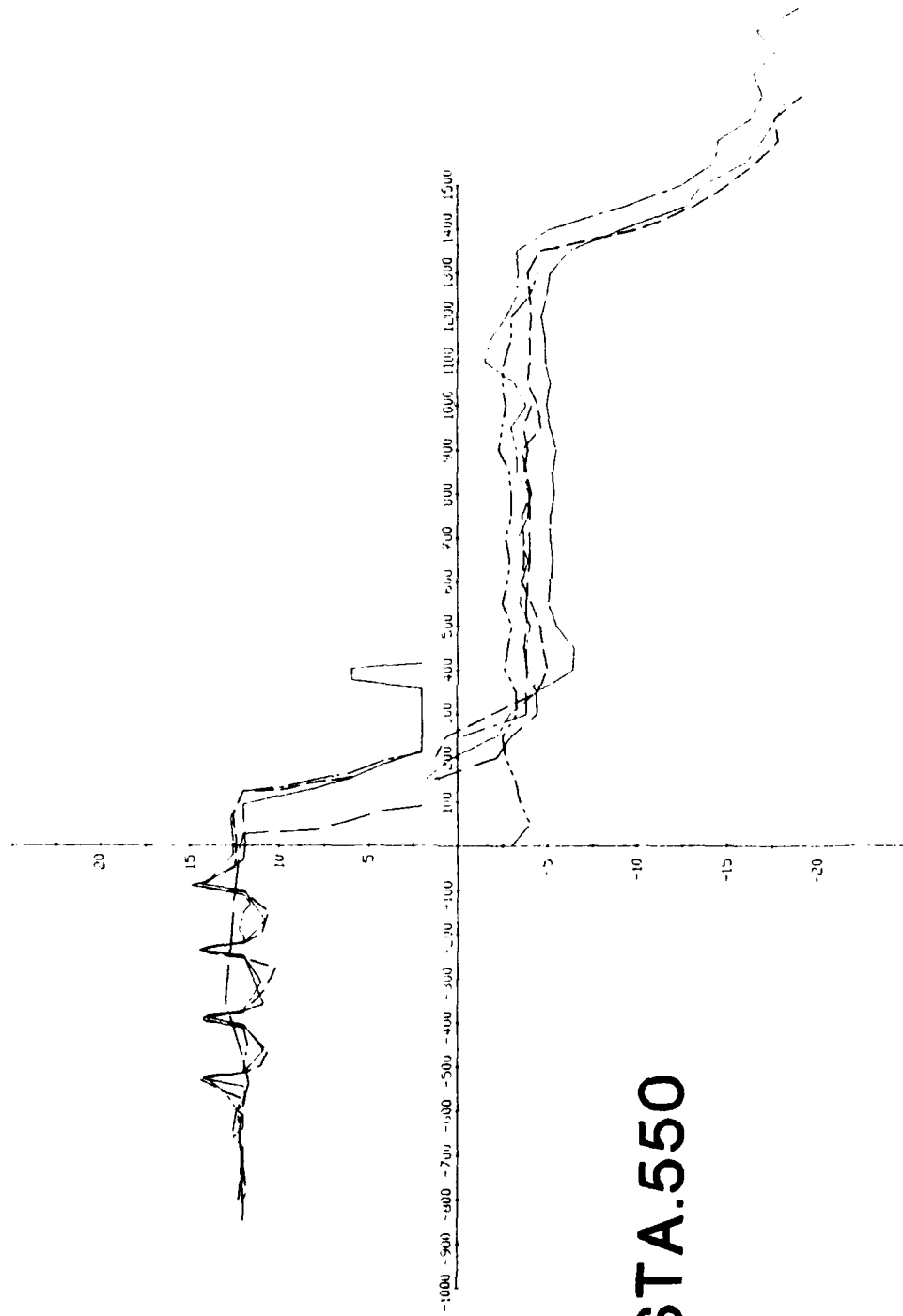
APPENDIX B  
SPIT HYDROGRAPHIC AND TOPOGRAPHIC PROFILES

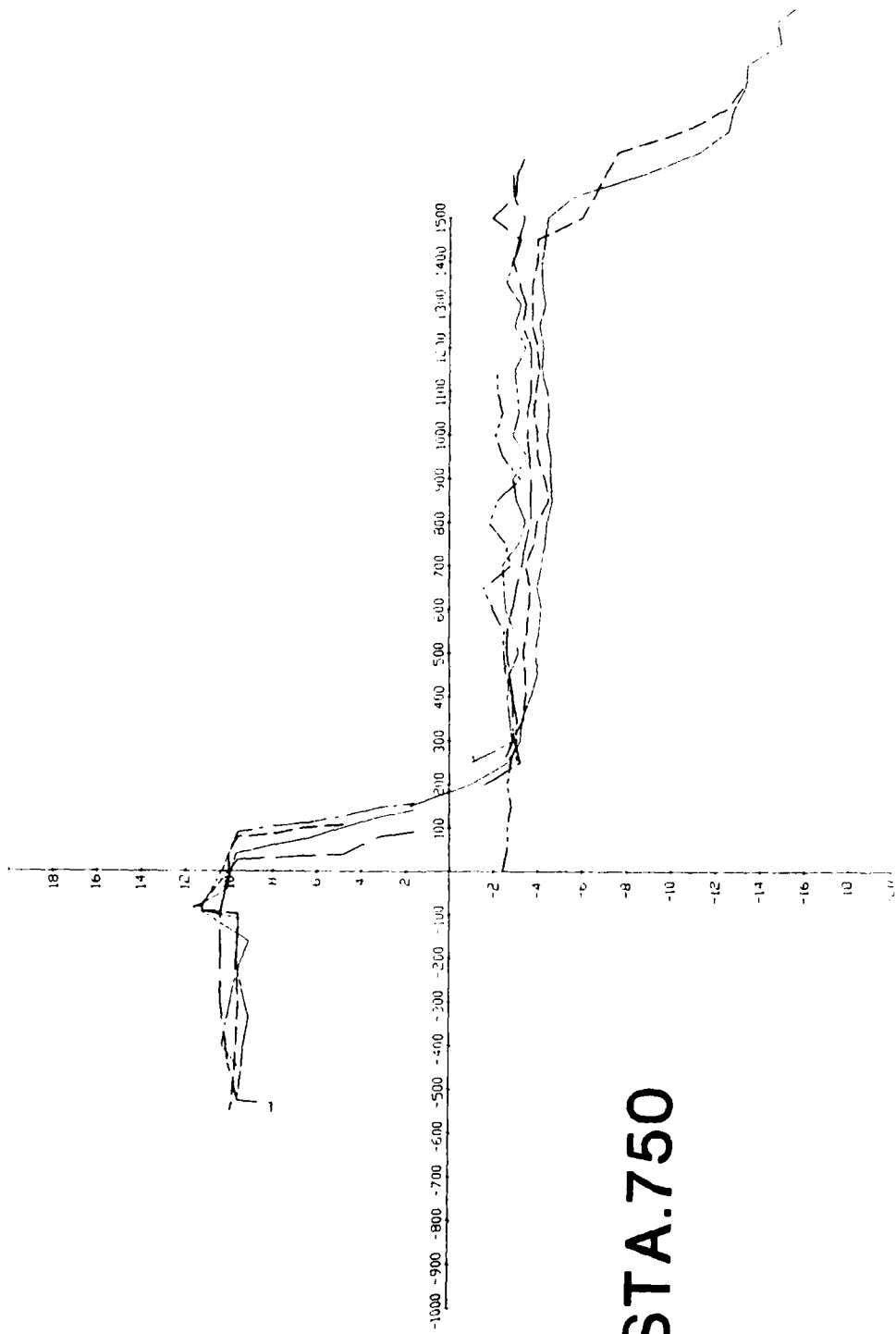


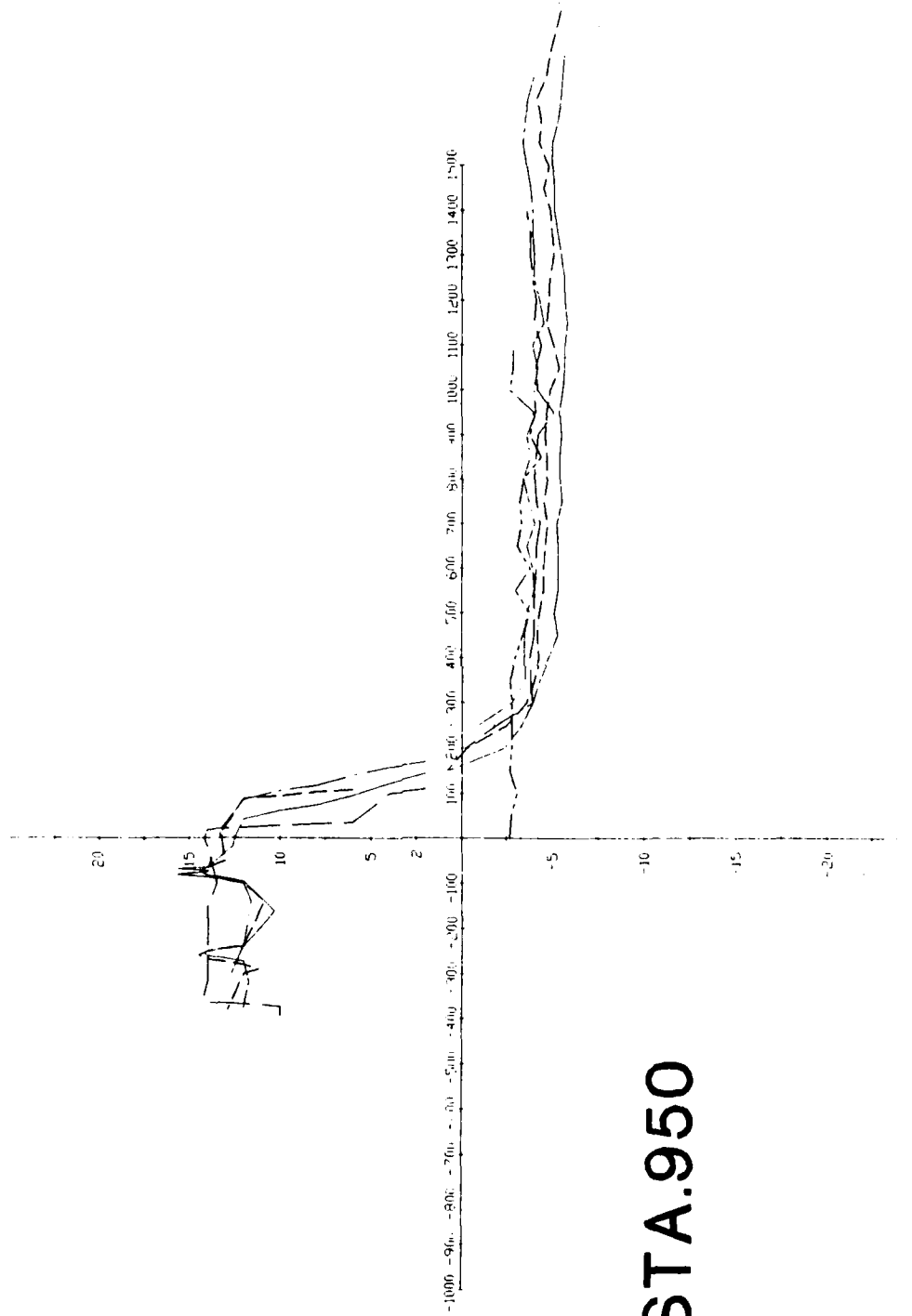
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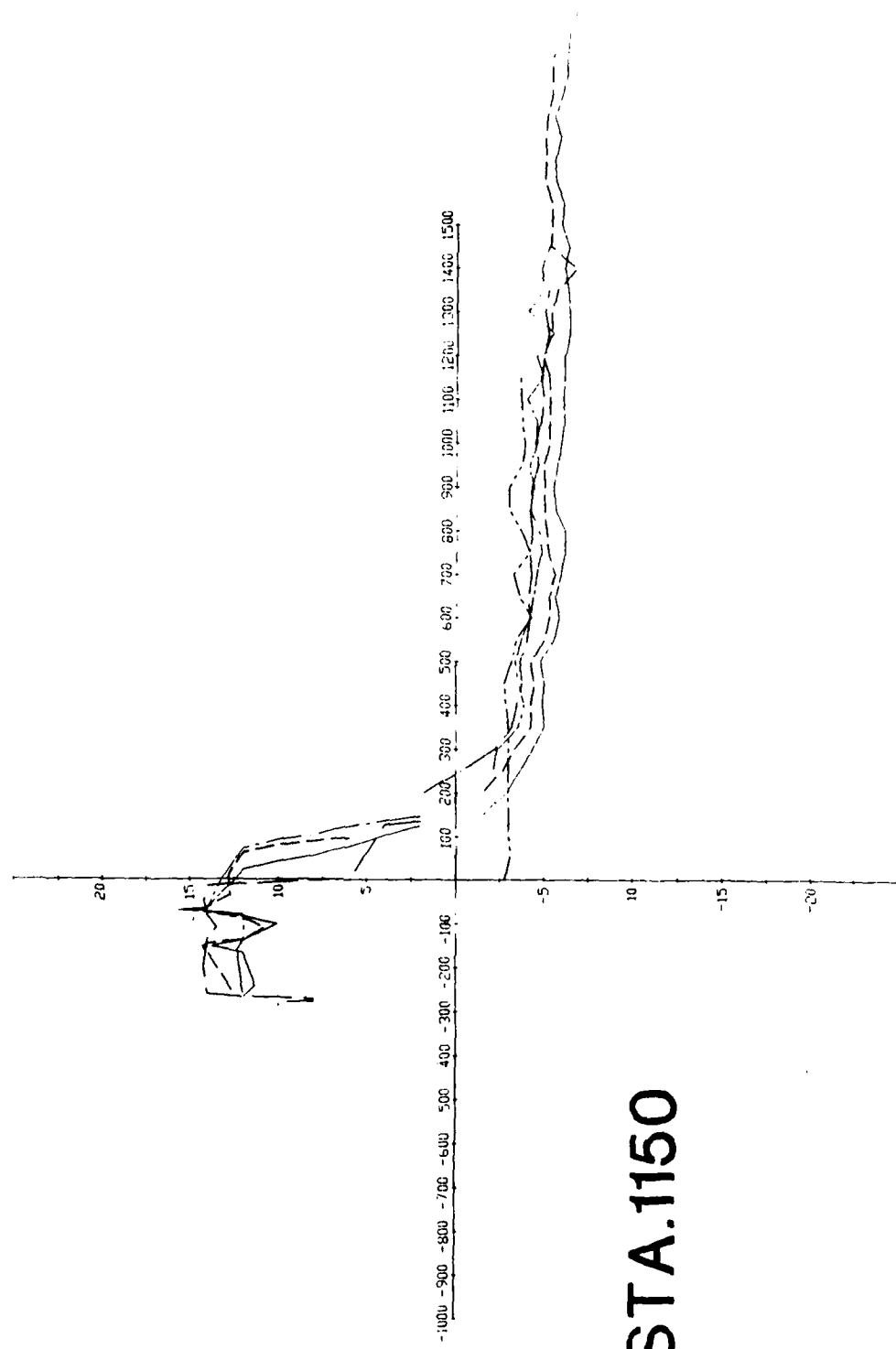
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-----	<b>JULY 1984</b>
-----	<b>FEBRUARY 1985</b>
-----	<b>NOVEMBER 1985</b>
-----	<b>SEPTEMBER 1986</b>



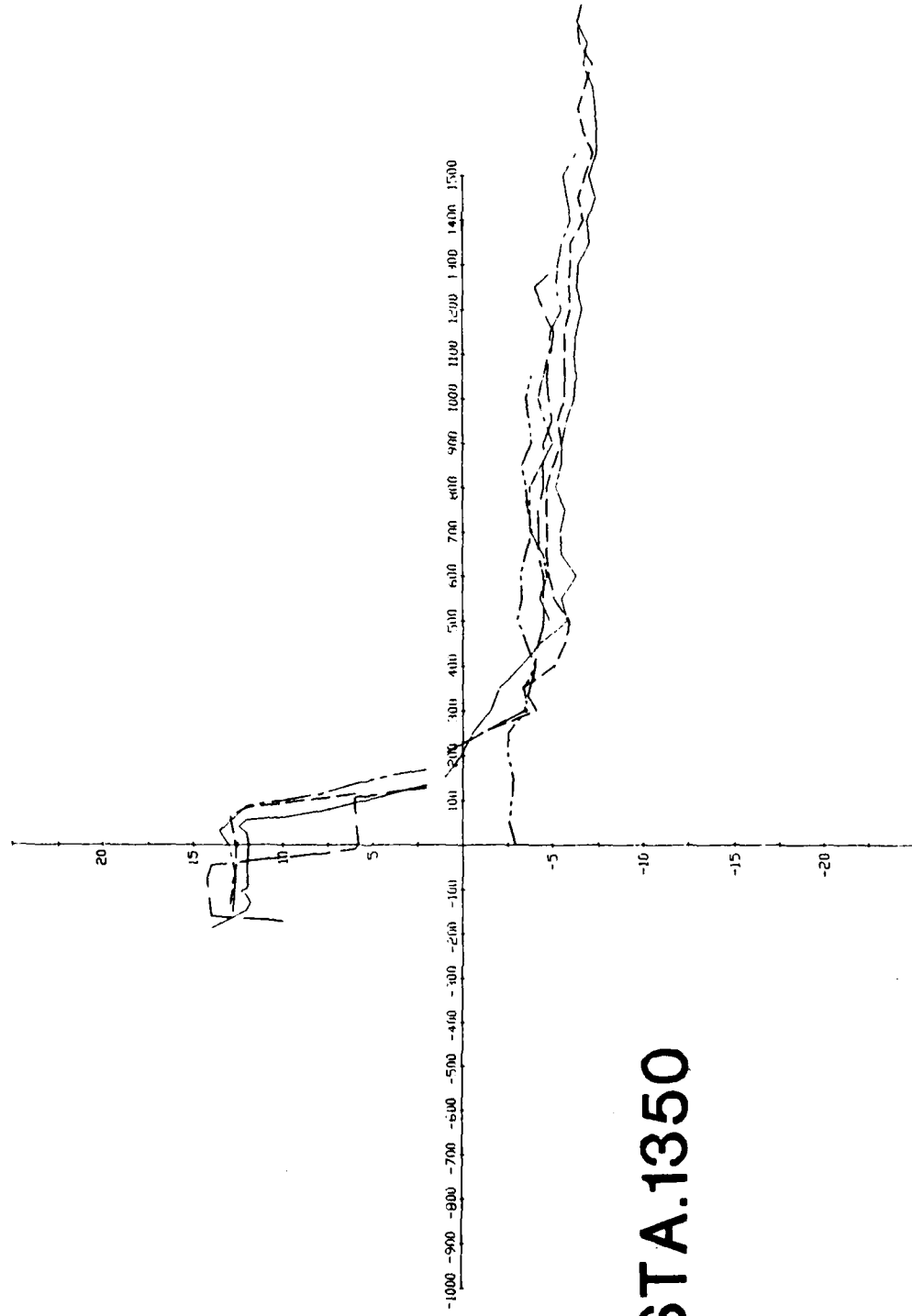




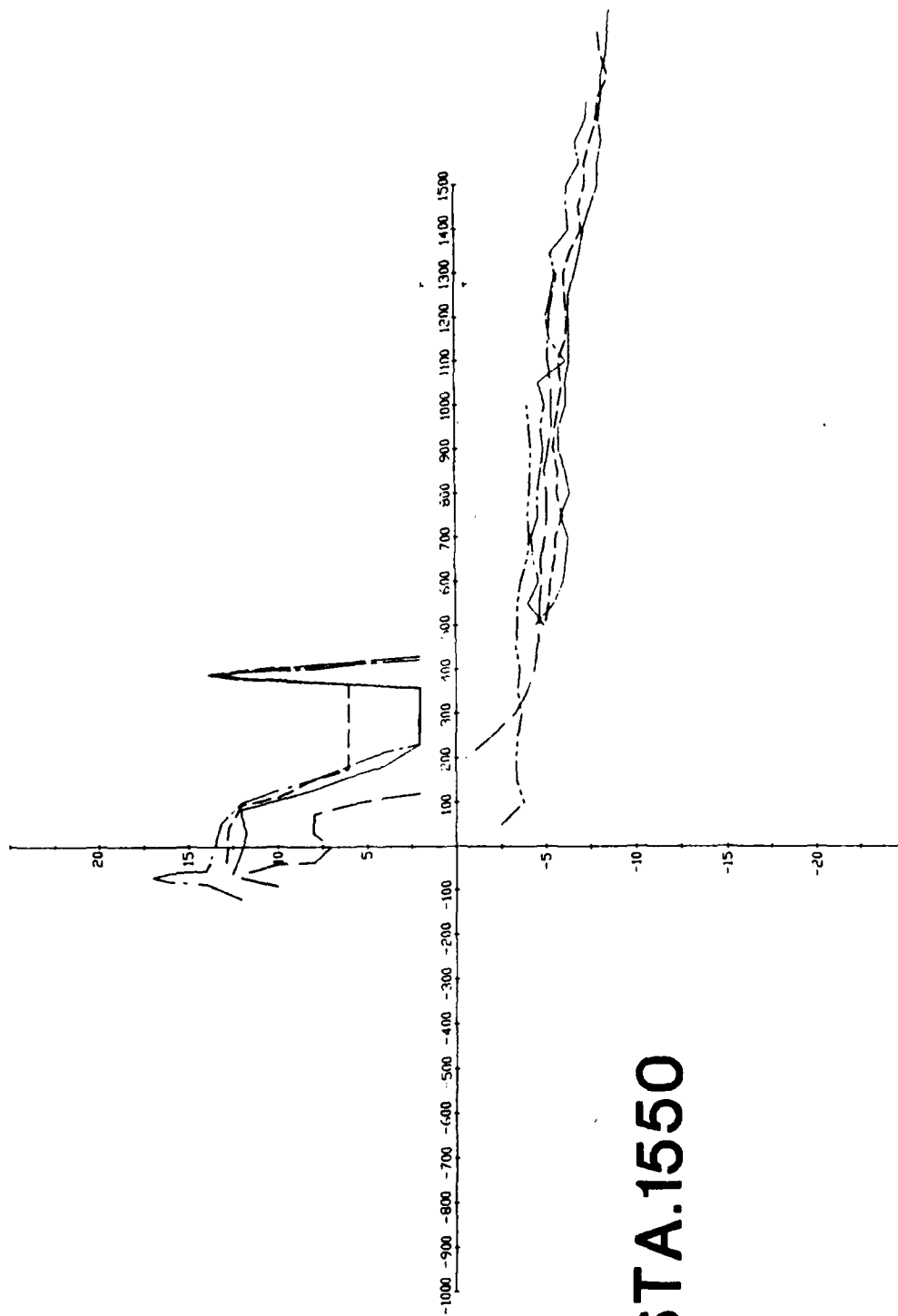




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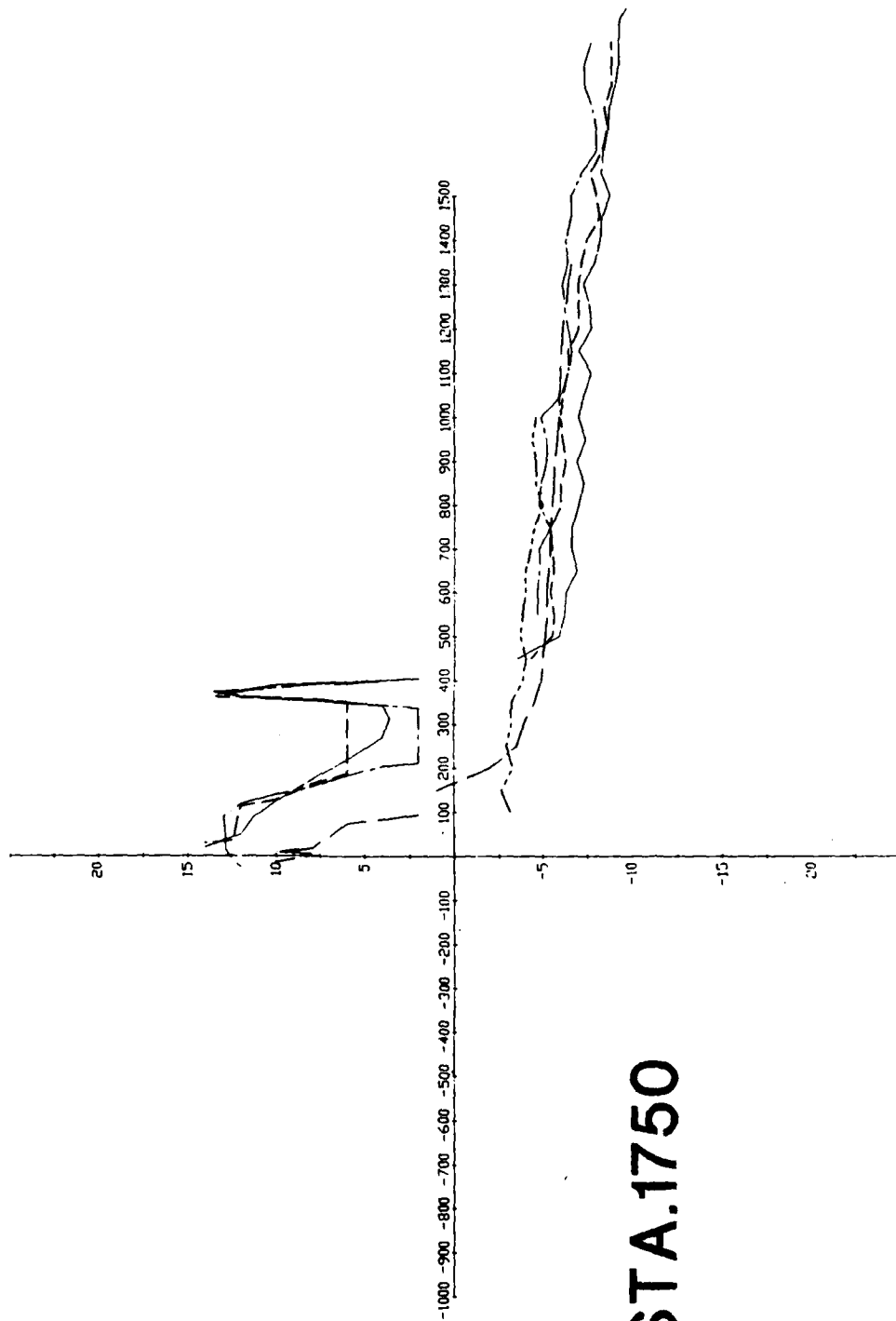


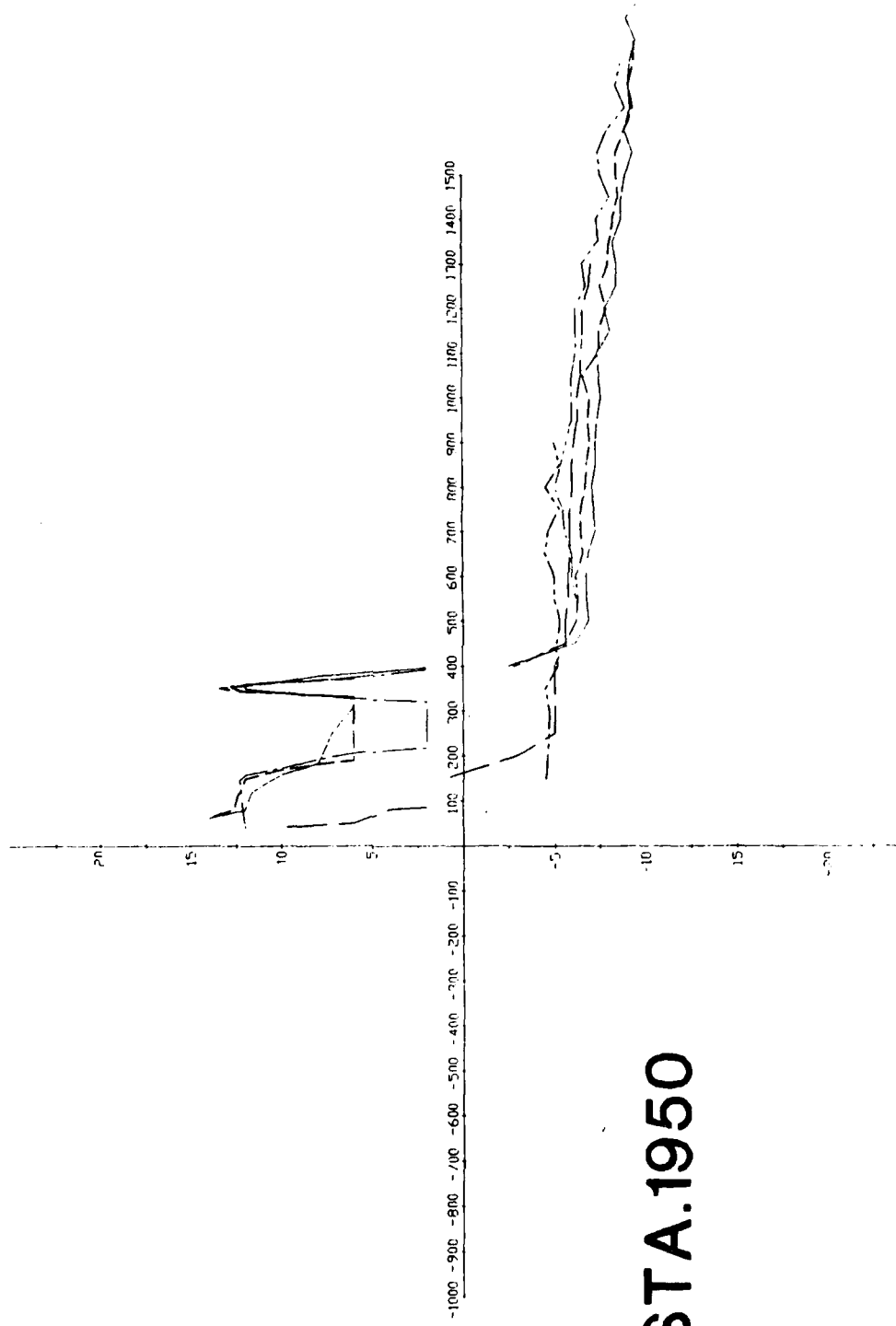
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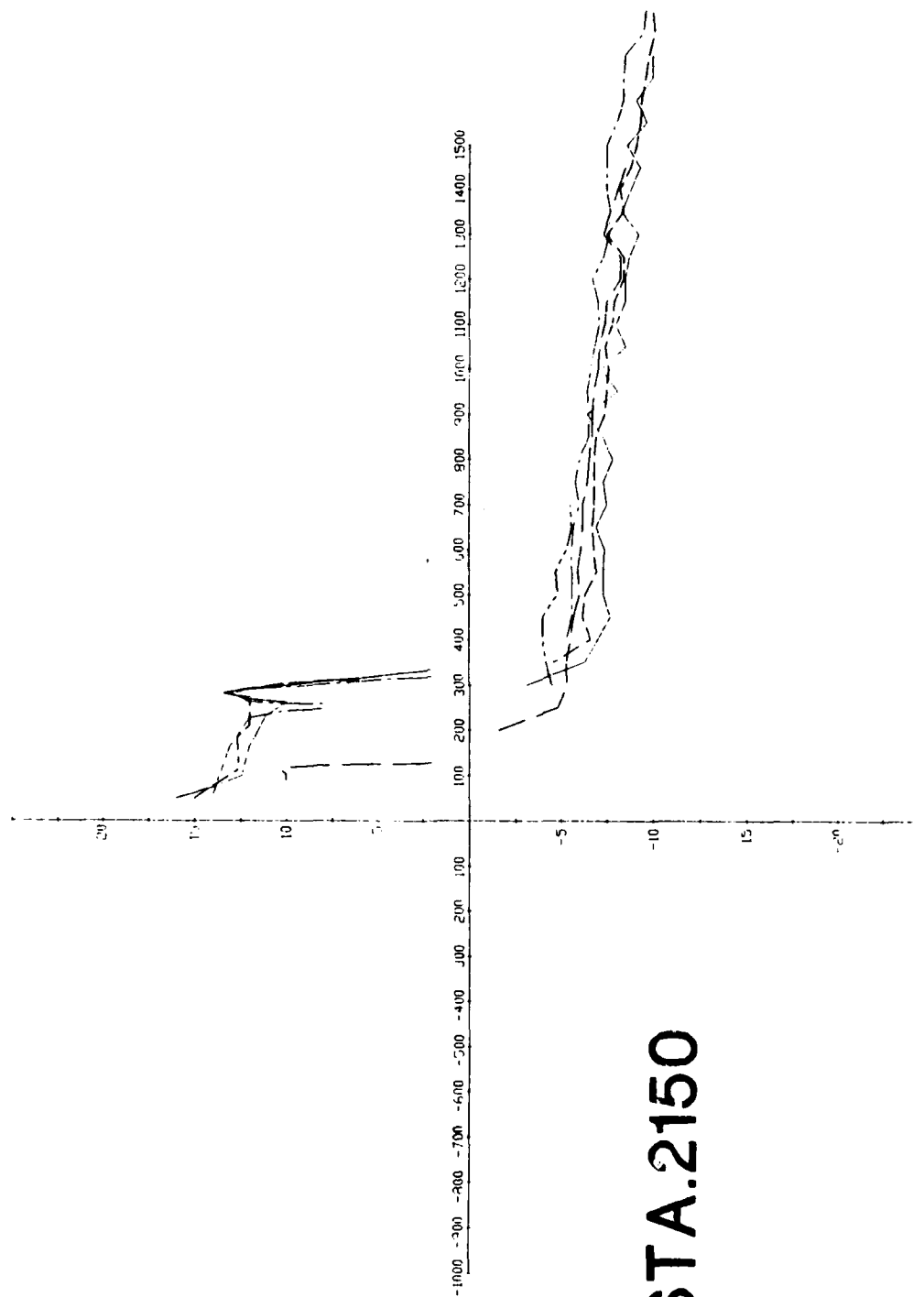


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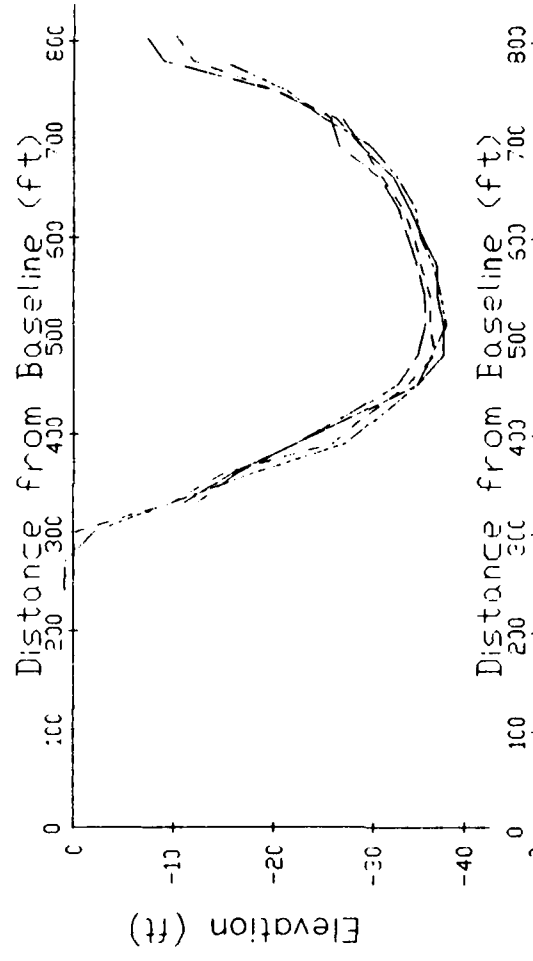


APPENDIX C  
FIELDS LANDING HYDROGRAPHIC PROFILES

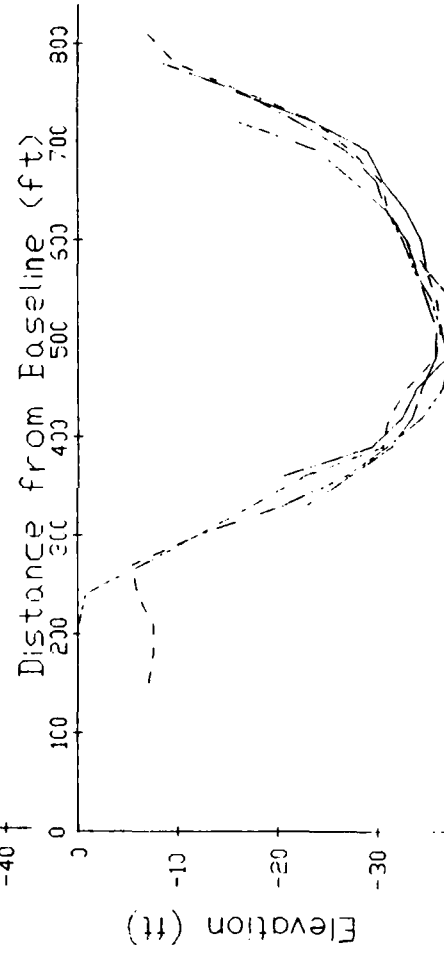
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_____	APRIL 1986

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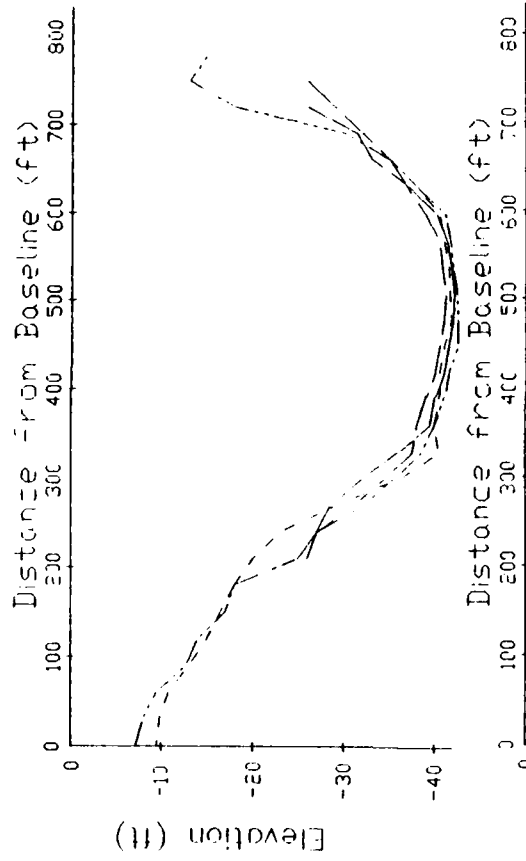


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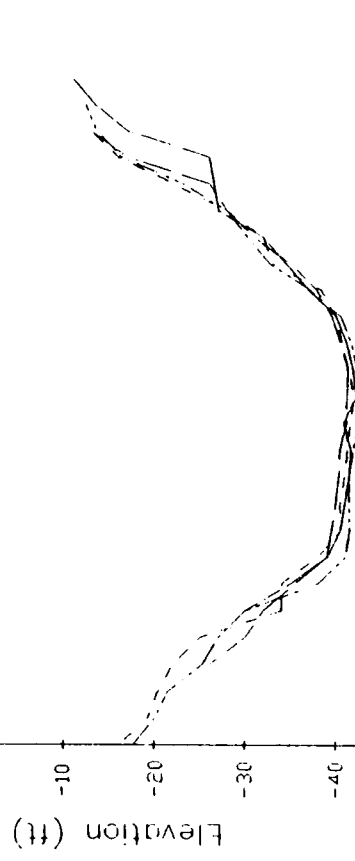


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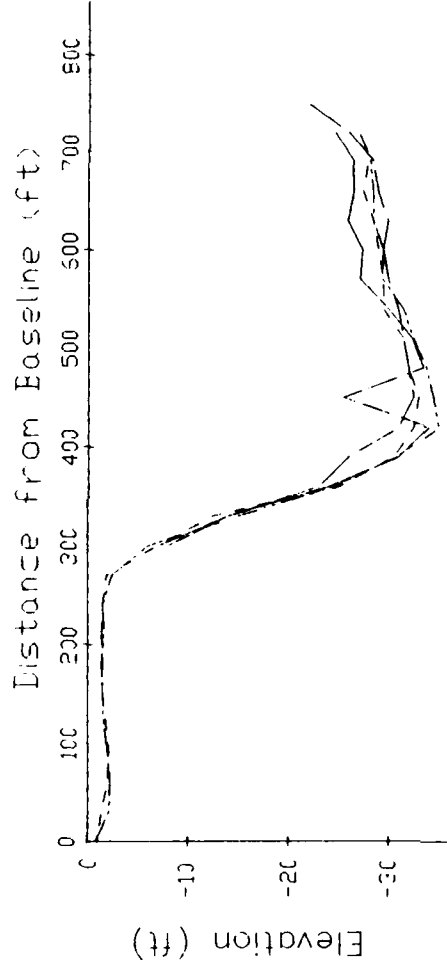


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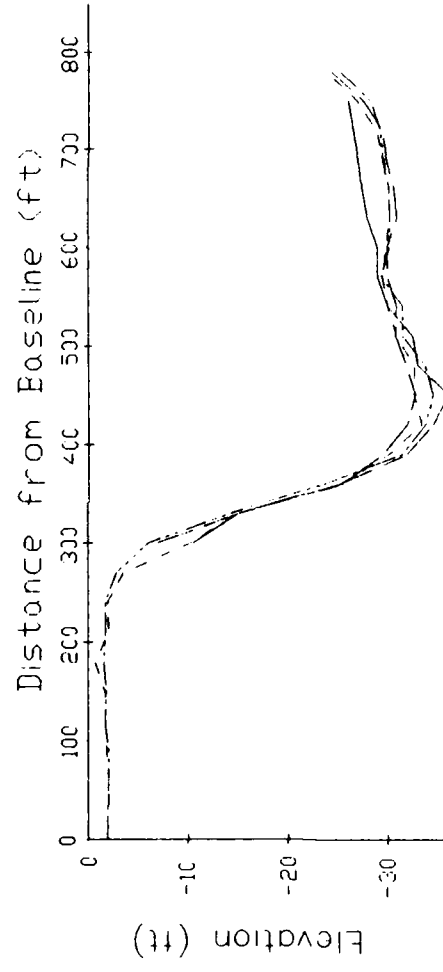


NOTE: Elevation  
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MLV

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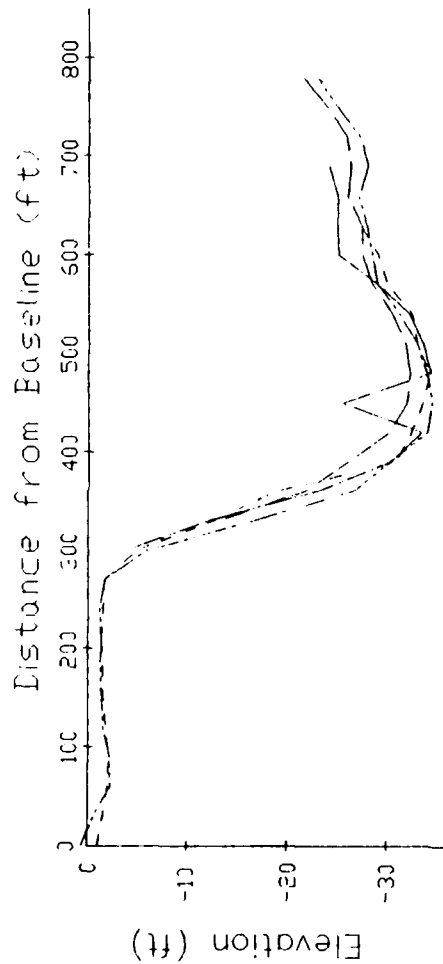
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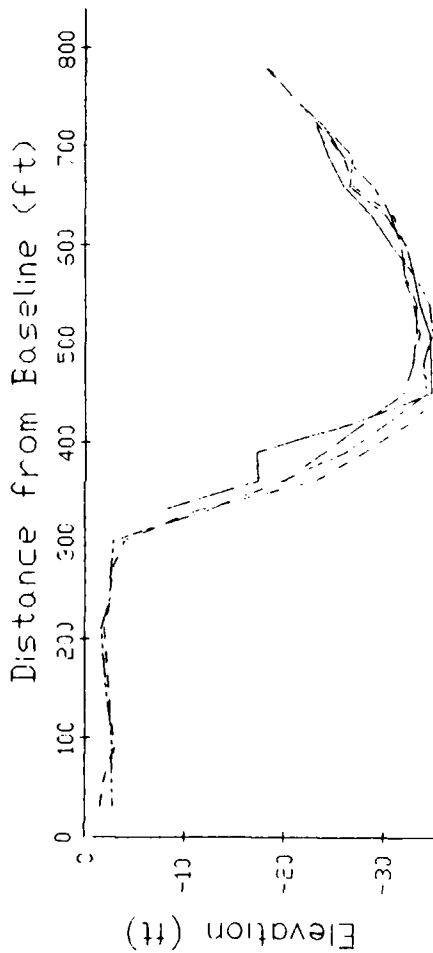
NOTE: Elevation  
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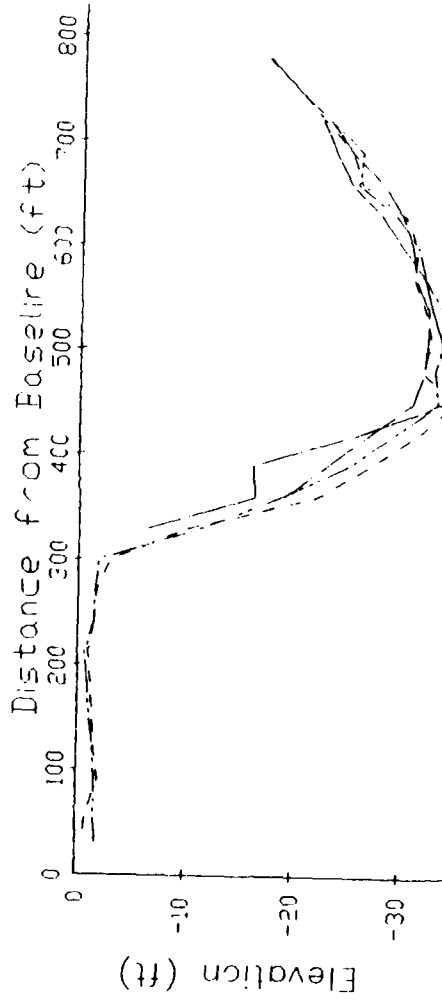


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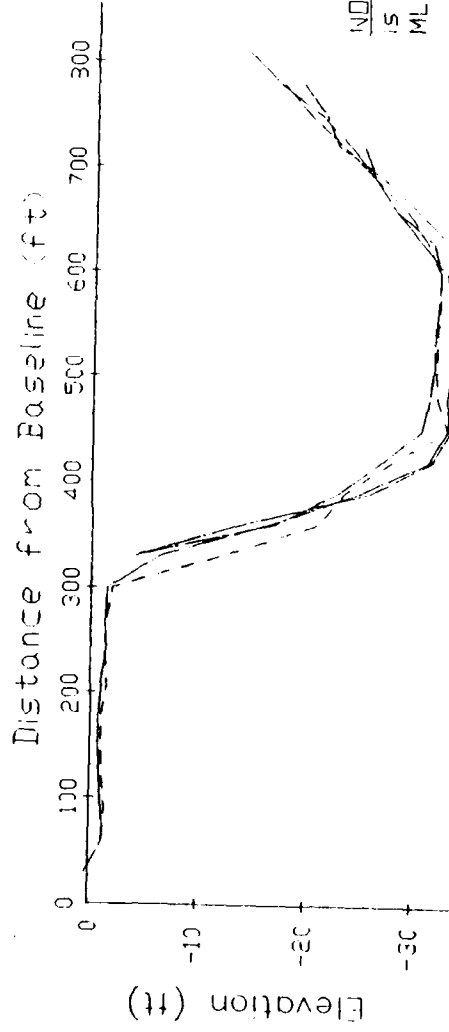


NOTE: Elevation  
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M.L.L.W.

# STA 3S



# STA 5S



NOTE: Elevation  
is based on  
MLLW

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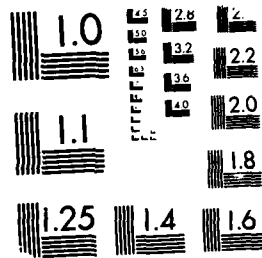
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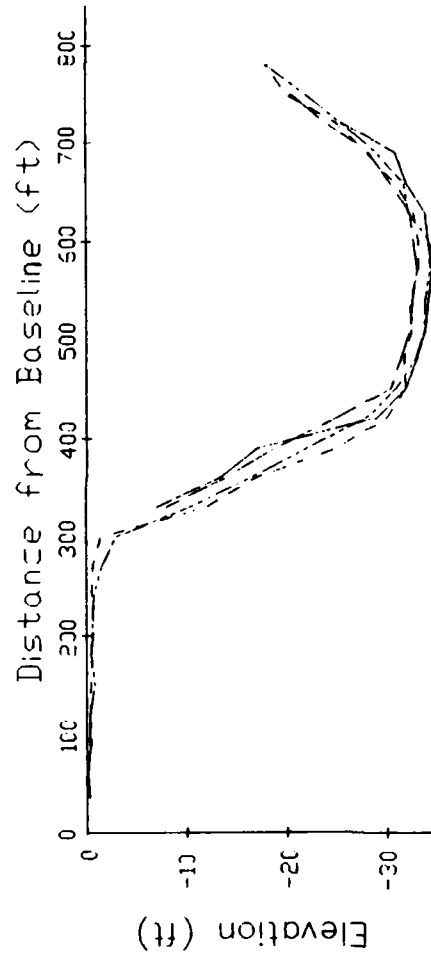
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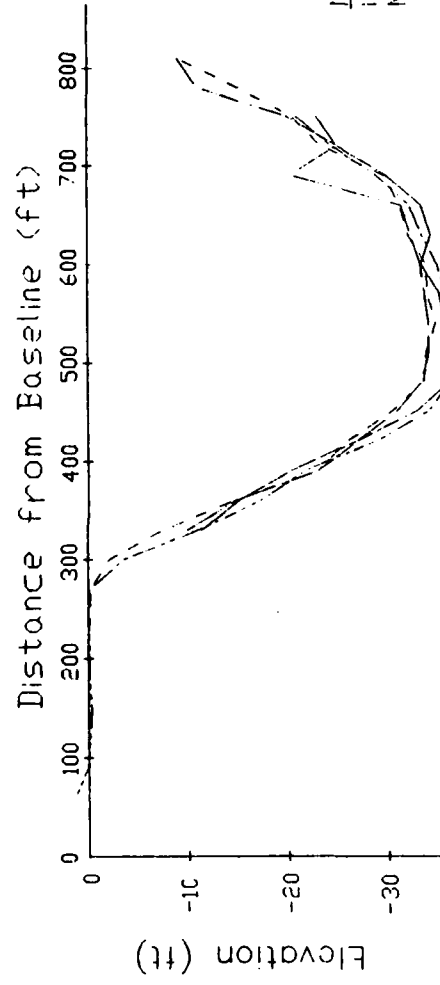




MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS 1963-A



**STA 9S**



**STA 11S**

NOTE: Elevation  
is based on  
MLLW

APPENDIX D  
SAND SAMPLING ANALYSIS

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**BUHNE POINT SHORELINE EROSION DEMONSTRATION PROJECT**

**SAND SAMPLING ANALYSIS**

**U. S. ARMY CORPS OF ENGINEERS  
LOS ANGELES DISTRICT**

**MARCH 1987**

## BUHNE POINT SHORELINE EROSION DEMONSTRATION PROJECT SAND SAMPLING ANALYSIS

### I. INTRODUCTION

1.01 Purpose and Scope. The purpose of this soils appendix is to compare soil sample gradations taken at periodic intervals (from June 1983 to October 1986) as part of a monitoring program at Buhne Point. The scope of this report includes a brief description of the project history, a description of all investigations conducted, including the most recent investigation in October 1986, an analysis of all soil sample gradation data, and any conclusions that can be drawn from the available data. The analysis is based on grain size comparisons only.

1.02 Project Location and History. The Buhne Point Shoreline Erosion Demonstration project was conducted under the authority of the Federal Highway Administration by the U.S. Army Corps of Engineers. The project is located in Humboldt Bay, California, approximately 225 nautical miles north of San Francisco and was constructed in three phases. The three phase project was designed to restore the badly eroded Buhne Spit and to provide protection from wave attack to Buhne Drive.

Phase I consisted of construction of an 1250-foot long timber groin with an 150-foot long stone groin at the head of the structure. Phase II consisted of placing 600,000 cubic yards of sand fill on the upcoast side of the timber groin and stone slope protection on the channel side of the timber groin. Phase III consisted of the addition of a shore connected breakwater on the upcoast side of the sand fill and an extension of the Phase I groin. The final stage of this project consisted of monitoring Buhne Point to determine if there has been movement of material onto or off of the sand fill or movement of materials through the groin or breakwater.

1.03 Previous Reports. This soils appendix was preceded by a soils report in November 1985 and an interim soils report in July 1986. The two previous reports served as updates for the monitoring program being conducted at Buhne Point and made preliminary conclusions whenever possible.

## II. INVESTIGATIONS AND LAB TESTING

2.01 Field Investigations. Geotechnical investigations for Phase I were conducted in 1983 by the Los Angeles District and consisted of drilling holes with a barge mounted, 4-inch diameter rotary drill rig in the fill area and the borrow area to determine foundation conditions and to locate possible material for the Phase II sand fill. The gradations of these materials are shown in tables 1 and 2. As a part of a monitoring program planned by the Coastal Resources Branch, shallow surface samples were obtained in June 1984, June 1985, August 1985, October 1985, May 1986 and October 1986 by San Francisco District personnel. These samples were obtained from the sand fill, offshore of the sand fill, the channel side of the groin and the channel side of the breakwater. See tables 3 through 8 for gradations and see plate 1 for sample locations.

2.02 Field Observations. Shoaling of materials was observed, during a field inspection in March 1985, on the channel side of the stone groin constructed in the Phase I Project. A depression in the sand fill where the sand meets the stone groin was also observed during the same field inspection, as mentioned in the November 1985 soils report. The field inspection was conducted during the Phase III grouting of the concrete diaphragms in the groin and the breakwater.

2.03 Lab Testing. Mechanical analyses were performed on all samples obtained during the monitoring program at Buhne Point by the Army Corps of Engineers, South Pacific Division Lab. Mechanical analyses were conducted in accordance with Engineering Manual, E.M. 1110-2-1906, Soils Lab Testing. Atterberg limits were not determined on materials passing the number 200 sieve and, therefore, could not be classified as silt or clay. For the purpose of analysis, it is assumed that material passing the number 200 sieve is a silt.

### III. ANALYSIS

3.01 General. Samples obtained in June 1984 were intended to be used as base data. However, the samples taken in June 1985 were from different locations than those taken in 1984 and cannot be used for direct comparisons. Therefore, the June 1985 sample data will be considered the base data for samples taken during August and October of 1985, and May and October of 1986 which were obtained from the same sample locations established during the June 1985 investigation. A major portion of the data analysis will be based on the aforementioned sampling periods. The 1983 borrow investigation gradations are used as a preliminary data set for comparison with the existing sand fill. Comparisons between the 1984 gradations and all subsequent sample gradations are made whenever possible. In some cases, mean gradations are used to simplify comparisons with mean gradations from similar sample locations (i.e., sand fill, offshore of breakwater, etc.) but with different sampling periods. The comparisons in this report are based only on gradations; the comparisons do not consider the effects of wind, waves, tides, or currents.

3.02 Sand Fill. For discussion purposes, the sand fill area will be broken up into three separate regions: 1) the landward side of the sand fill crest, 2) the crest of the sand fill, and 3) the sand fill slope face.

3.02.1 Sand Fill Landward of Crest. The 1983 borrow material mean gradation was compared to the 1984 sand fill sample mean gradation to determine if the material had remained the same since placement of the fill. See table 1 for borrow material gradations, table 3 for sand fill gradations, and table 9 for comparison of borrow material to sand fill material. As stated in the November 1985 soils report, both materials have gradations which are essentially the same. The sand fill and borrow material gradations consist primarily of fine grained sand with a smaller percentage of medium grained sand.

3.02.2 Crest of Sand Fill. Samples were obtained at three locations on the crest of the sand fill for five different sampling periods (from June 1985 to October 1986) and their gradations are shown in tables 4 through 8. Mean gradations for the five sampling periods were used for comparison purposes and are shown in table 10. The material on the crest of the sand fill consists of predominantly fine to medium grained sand. The mean gradations show that there has been very little change of material gradation at the sand fill crest, although samples taken in the late spring (June 1985 and May 1986) appear to be slightly finer grained sand.

3.02.3 Sand Fill Slope Face. Samples were taken from three locations on the sand fill slope face for five sampling periods (from June 1985 to October 1986) and their gradations are shown in tables 4 through 8. Mean gradations were used to compare the different sampling periods and are shown in table 11. As stated in paragraph 3.02.1, the sand fill material is predominantly a fine grained sand with a smaller percentage of medium grained sand. The samples taken in June 1985 on the slope face are considerably coarser than the original sand fill borrow material and classify as a medium grained sand. However, subsequent investigations in the same location indicate that the material has become finer, so that in October 1986 (the most recent sampling date) the sand is a fine to medium grained sand.

3.03 Offshore of Sandfill. Three locations offshore of the sand fill have been sampled on a regular basis from August 1985 to October 1986 and the material gradations are shown in table 12. A mean gradation for samples 12, 13, and 14 could not be used for comparison due to the significant difference in materials at these locations. Sample location number 12 (see plate 1) is located offshore of the sand fill and just inside of the groin head. The first sample taken at this location in August 1985 classifies as either a silty-sand or a clayey-sand. However, in the October 1986 sample there were very little fines and the sample classifies as a fine to medium grained sand. Samples taken at location number 13, halfway between the head of the groin and the head of the breakwater, have essentially remained the same throughout the entire sampling program. The material is a silty, fine grained sand. At location number 14, just inside the head of the breakwater, the samples obtained from August 1985 through May 1986 were gravelly sands with the sand fraction being predominantly medium grained. However, the sample taken in October 1986 differs considerably. This sample classifies as a fine grained sand with no gravel.

Two additional locations offshore of the sand fill, were sampled three times each from October 1985 to October 1986. Sample location number 15 was just outside of the breakwater head and location number 16 was just outside of the groin head (see plate 1). Gradations for these two locations are shown in table 13. The October 1985 sample gradation at sample location 15 classifies as a gravelly, fine grained sand. The next sample was obtained in May 1986 and classifies as a fine grained sand with no gravel. Finally, the most recent sample taken in October 1986 has a gradation which is coarser and classifies as a fine to medium grained sand. The first sample taken from location number 16 (October 1985) has more than 50% by weight passing the number 200 sieve and is therefore either a sandy silt or a sandy clay. The next sample taken in May 1986 had a significantly coarser gradation and classifies as a silty, gravelly, fine to medium grained sand. The final sample taken outside of the groin has a

gradation which has become finer and classifies as a fine grained sand/silty sand. Also included in table 13 are the gradations of two samples taken in June 1984 at locations 5 and 6 offshore of the sand fill (see plate 1). Sample number 5 is similar to the October 1985 sample at location 16 (greater than 50% fines) which may indicate that the material in this area has not changed since June 1984.

3.04 Channel Side of Groin. Only two locations were sampled on a regular basis on the channel side of the groin. Sample locations 5 and 6 were sampled in June 1985, August 1985, October 1985, May 1986 and October 1986 and their gradations are shown in tables 4 through 8. Mean gradations were used for comparison purposes for sample locations 5 and 6 and are shown in table 14 for each sampling date. The June 1985 mean sample gradation indicates that the material is a fine grained sand. Samples taken during the next two investigations indicate that the sand had become slightly coarser, however, the May 1986 mean sample gradation is similar to the original June 1985 mean gradation. The most recent investigation (October 1986) resulted in a mean sample gradation which had some gravel and slightly more silt than previously sampled materials.

3.05 Offshore of Breakwater. Only one location was investigated offshore of the breakwater. Sample gradations were determined for June 1985, August 1985, October 1985, May 1986 and October 1986 (see table 15). The first sample gradation was a fine sand. The final four investigations resulted in samples with gradations that essentially remained unchanged.

#### IV. CONCLUSIONS AND RECOMMENDATIONS

1. The sand fill material landward of the beach slope face has remained essentially the same.
2. The sand on the slope face is somewhat coarser than the original sand fill material. This is not unusual due to the fact that waves, tides and currents generally tend to transport materials with finer grain sizes seaward.
3. In general, the gradations of materials offshore of the sand fill tend to show an increase in fine sands. This trend can be partially attributed to the loss of fine sands on the sand fill slope face. The areas showing the most significant increases in fine sand are located just inside the breakwater and around the head of the groin.
4. Considerations should be given to a general assessment of the coastal process to determine the movement of sand which is beyond the scope of this analysis.

TABLE 1: 1983 Samples Of Borrow Material For Sand Fill\*\*

Test Hole	Sample	PERCENT PASSING SIEVE										
		1 1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#60	#100	#200
TH-83-8	1	---	---	---	---	---	100	99	76	34	---	4
	2*	---	---	---	---	---	---	---	---	---	---	---
	3	---	---	---	---	100	98	95	88	45	---	4
	4*	---	---	---	---	---	---	---	---	---	---	---
	5	---	---	---	100	99	98	95	79	49	---	3
TH-83-9	1	---	---	---	---	---	---	100	55	14	---	1
	2	---	---	---	---	---	100	99	86	57	---	6
	3*	---	---	---	---	---	---	---	---	---	---	---
MEAN		---	---	---	100	100	99	98	77	40	---	4

\*Samples not tested

\*\*Test Holes TH-83-8 and TH-83-9 are located on Plate 2 in the Phase II Buhne Point Shoreline Erosion Demonstration Study Report.



TABLE 2: 1983 Sand Fill Foundation Samples

Test Hole	Sample	PERCENT PASSING SIEVE										
		1 1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#60	#100	#200
TH-83-7	1	---	---	---	---	---	100	99	98	97	---	59
	2*	---	---	---	---	---	---	---	---	---	---	---
	3	---	---	---	---	---	---	---	100	99	---	90
TH-83-11												
	1	---	---	---	---	100	98	97	94	77	---	5
	2	---	---	---	---	100	99	99	98	97	---	42
	3*	---	---	---	---	---	---	---	---	---	---	---
	4	---	---	---	---	---	---	---	---	100	---	95
	5*	---	---	---	---	---	---	---	---	---	---	---

\*Samples not tested

**TABLE 3: 1984 Sample Gradations**

[illegible]

TABLE 4: June 1985 Sample Gradations

SAMPLE	LOCATION	PERCENT PASSING SIEVE										
		1 1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#60	#100	#200
1	Offshore of Breakwater	---	---	---	---	---	---	100	99	76	13	4
2	Sand	---	---	100	99	99	98	92	31	13	2	1
3	Fill	---	100	99	98	97	90	70	17	5	1	1
4	Slope	100	95	94	93	91	87	72	12	6	2	1
MEAN #2,3,4	Face	100	98	98	97	96	92	78	20	8	2	1
5	Channel Side	---	---	---	---	---	---	100	98	52	4	2
6	of	---	---	---	---	---	---	100	97	38	3	1
MEAN #5,6	Groin	---	---	---	---	---	---	100	98	45	4	2
7	Crest	---	---	100	99	99	99	95	76	37	7	3
8	of	---	---	---	---	---	---	100	87	47	6	3
	Sand	---	---	---	---	---	---	100	77	37	9	5
9	Fill	---	---	100	99	99	98	96	77	37	9	5
MEAN #7,8,9	Slope	---	---	100	99	99	99	97	80	40	7	4

TABLE 5: August 1985 Sample Gradations

SAMPLE	LOCATION	PERCENT PASSING SIEVE										
		1 1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#60	#100	#200
1	Offshore of Breakwater	---	---	---	---	---	100	98	85	50	10	3
2	Sand	---	---	---	---	100	98	93	45	21	3	1
3	Fill	100	96	95	95	94	91	77	42	24	5	1
4	Slope	---	---	100	99	98	95	78	39	22	4	0
MEAN #2,3,4	Face	100	99	98	98	97	95	83	42	22	4	1
5	Channel Side of Groin	---	---	---	---	---	---	100	98	52	3	1
6		---	---	---	---	100	99	97	80	49	17	9
MEAN 5,6						100	99	98	89	51	10	5
7	Crest	---	---	---	100	99	98	94	68	32	4	2
8	of	---	---	---	---	100	99	97	72	33	5	3
9	Sand	---	---	---	---	100	99	97	81	39	7	3
MEAN #7,8,9	Fill Slope	---	---	---	100	100	99	96	74	35	5	3





**TABLE 6: (con'd) October 1985 Sample Gradations**

[illegible]

















TABLE 12: Gradation of Samples from Offshore of Sand Fill

PERCENT PASSING SIEVE																
DATE	SAMPLE	LOCATION	2" / 1 1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#60	#100	#200			
Aug 1985	12	Offshore of Sand Fill							100	99	84	43	29			
Oct 1985	12	" "				100	99	98	94	29	7	1	1			
May 1986	12	" "					100	98	94	56	14	2	1			
Oct 1986	12	" "						100	95	37	11	2	1			
Aug 1985	13	Offshore of Sand Fill								100	92	42	17			
Oct 1985	13	" "								100	93	55	25			
May 1986	13	" "		100	99	99	99	99	99	98	87	36	17			
Oct 1986	13	" "			100	99	99	96	96	95	87	42	24			
Aug 1985	14	Offshore of Sand Fill	100	92	90	86	83	73	65	20	5	2	1			
Oct 1985	14	" "	100 / 91	91	87	86	83	74	56	27	22	11	7			
May 1986	14	" "	100	95	90	84	77	58	43	7	4	1	1			
Oct 1986	14	" "						100	92	54	17	3	2			

**TABLE 13: Gradations of Samples Offshore of Sand Fill (Supplemental)**

[illegible]

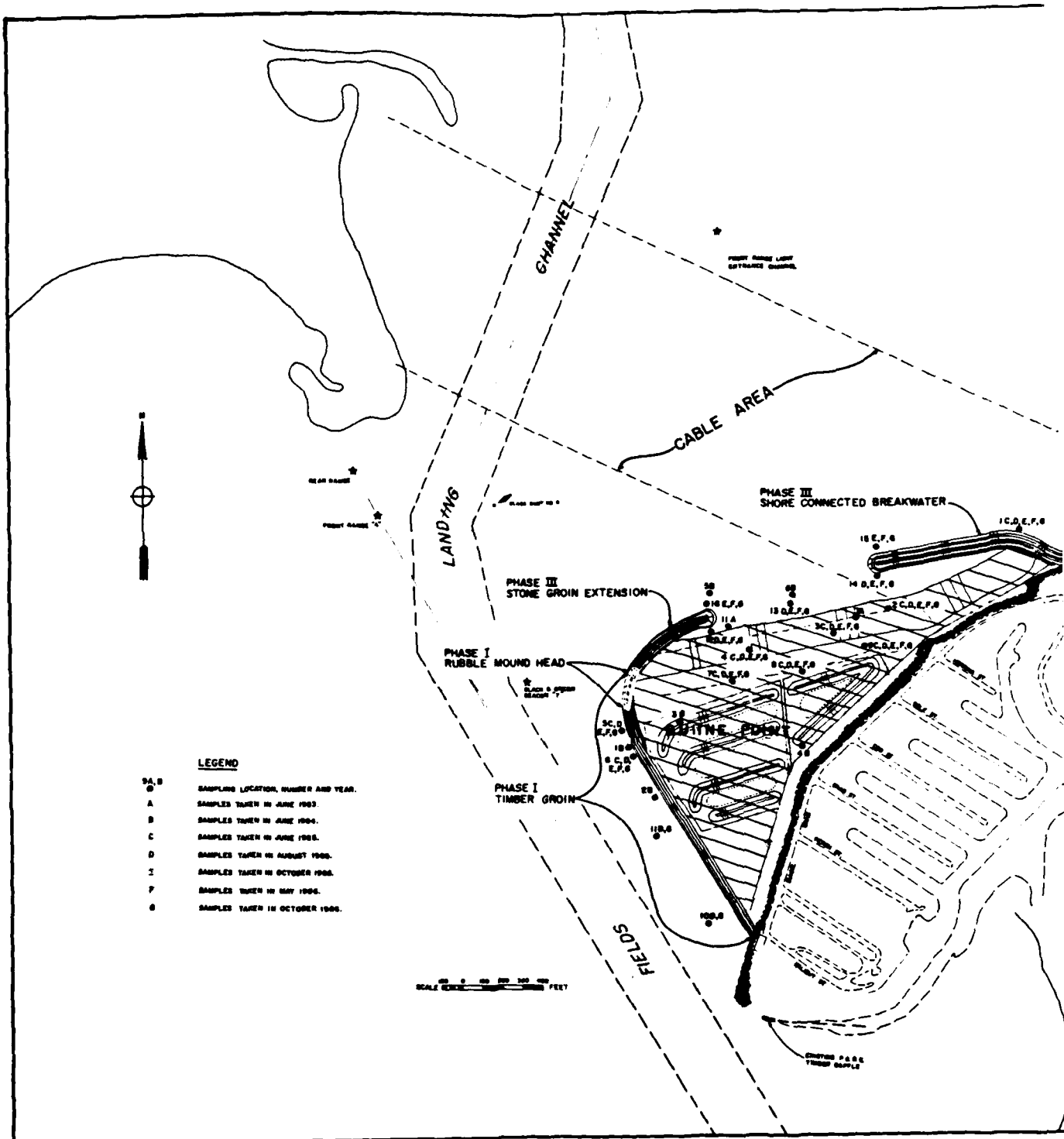


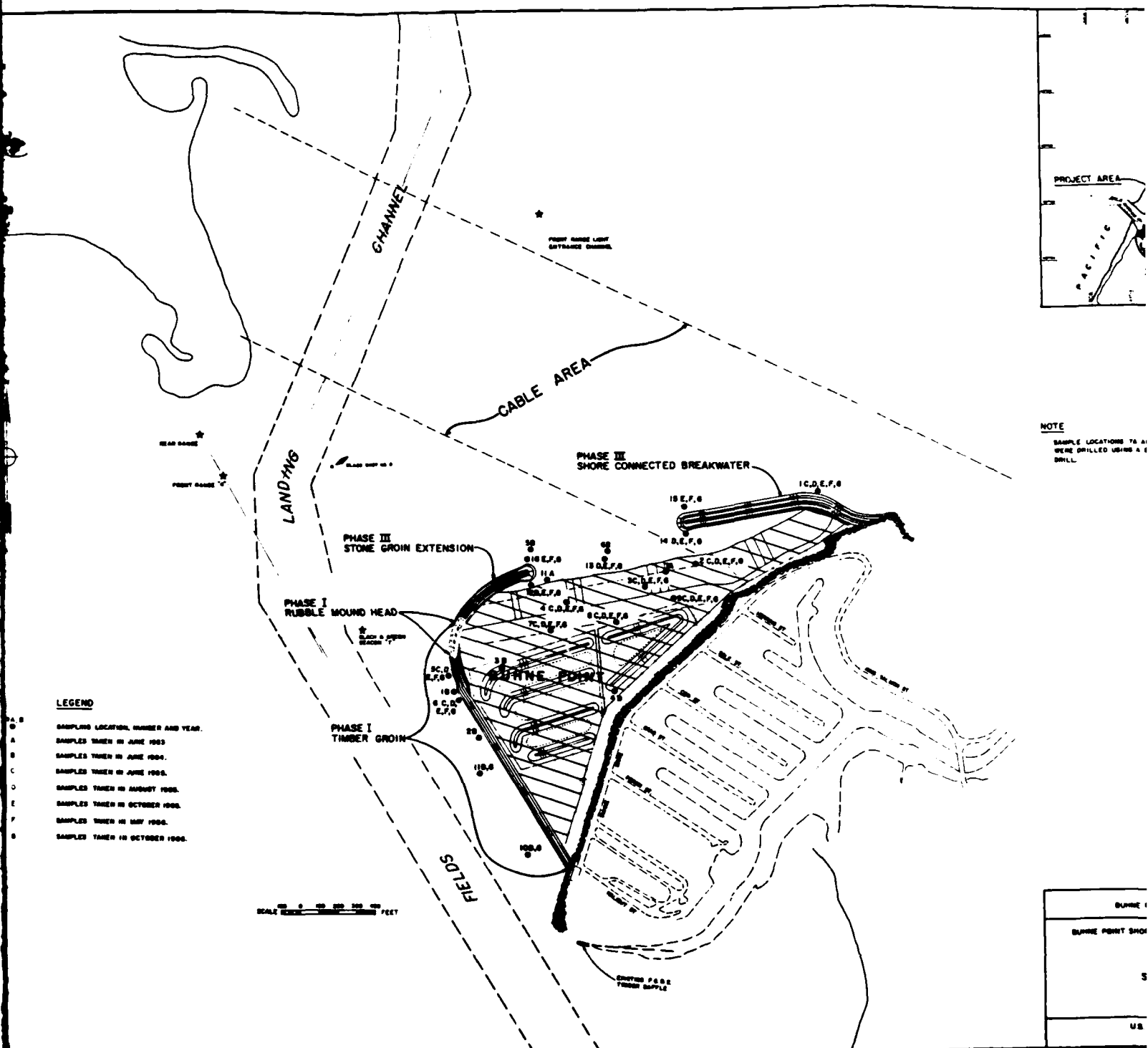
**TABLE 14: Mean Sample Gradations from Channel Side of Groin**

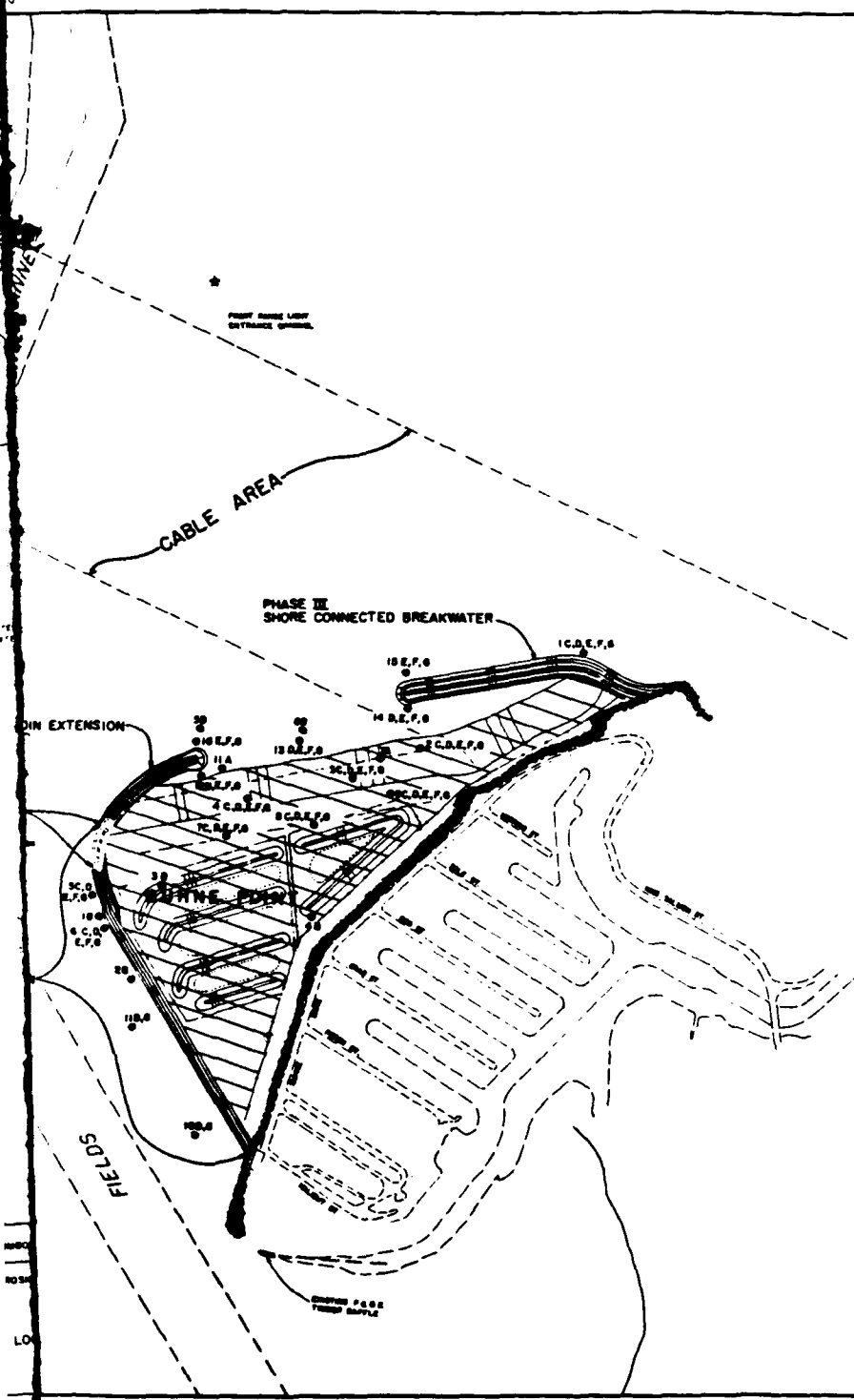
[illegible]

**TABLE 15: Gradations of Samples Offshore of Breakwater**

[illegible]







## **APPENDIX J**

**SECTION 1 ENVIRONMENTAL ELEMENTS  
REPORT**

**SECTION 2 SUMMARY REPORT-ENVIRONMENTAL  
ELEMENTS**

# **SECTION 1**

## **ENVIRONMENTAL ELEMENTS REPORT**

Buhne Point Shoreline Erosion  
Demonstration Project:  
Environmental Elements

December 1984



Buhne Point Shoreline Erosion  
Demonstration Project:  
Environmental Elements

Introduction

Buhne Point in South Humboldt Bay, California has experienced severe erosion on it's bayward margin attributed to dredging and shore protection activities at the bay entrance. Wave attack has damaged the only public access road to the adjacent community of King Salmon. The Federal Highway administration in cooperation with the US Army Corps of Engineers, the Humboldt Bay Harbor District and the county of Humboldt has developed a plan to restore and stabilize the sandy spit at Buhne Point. The restored spit will provide protection to the Federal Highway, a public beach and restore habitat for recreationally important fish, shellfish and migratory birds.

The project is being built in four phases. Phase I was designed and constructed by the county of Humboldt. It consists of a timber groin designed to stabilize the Phase II sandfill and to prevent the material from being transported downcoast (south) into Fields Landing channel. The groin is 1,250 feet long and roughly parallels Fields Landing channel for 1,000 feet then curves for 250 feet northward at a radius of 600 feet. The head of the groin is protected by a 200 foot long rubble mound groin. Toe protection to prevent scouring is provided on the downcoast (south) side of the groin in the form of quarry waste and one ton stone. A filter fabric on the upcoast side is provided to prevent sand from passing through the timber groin.

Phase II of the project, designed and constructed by the Corps of Engineers consists of restoring the sand spit at Buhne Point. The sandfill material was excavated by hydraulic dredging from a 4,000 by 400 foot borrow area located along side the Humboldt Bay entrance channel. Six hundred thousand (600,000) cubic yards of material were placed upcoast (north) of the timber groin and along Buhne Drive, forming a fill of approximately 24 acres. The crest elevation is plus 15 feet mean lower low water (MLLW) to reduce erosion losses between Phase II and Phase III. The material will be spread out during Phase III construction to plus 12 feet MLLW.

Phase III of the project is designed to stabilize the sandfill on a long-term basis. Phase III will consist of rock revetment placed along the downcoast face of the Phase I timber groin, a 425 foot rubble mound extension of the Phase I timber groin and a 1,044 foot rubble mound shore connected breakwater located at the upcoast end of the Phase II sandfill (Fig. 1). Phase III will also include stabilization measures to protect the sandfill from wind erosion. These measures will include sand fence installation during Phase III Construction.

Phase IV consists of a sand stabilization/revegetation and monitoring program.

The monitoring program, designed to document the project's performance and effect on the nearshore environment, has been incorporated into the project. The monitoring program will include hydrographic foreshore surveys (conducted three times each year), aerial surveys, sand sampling and analysis, a Littoral Environment Observation Program (LEO) and a Biological Monitoring Program.

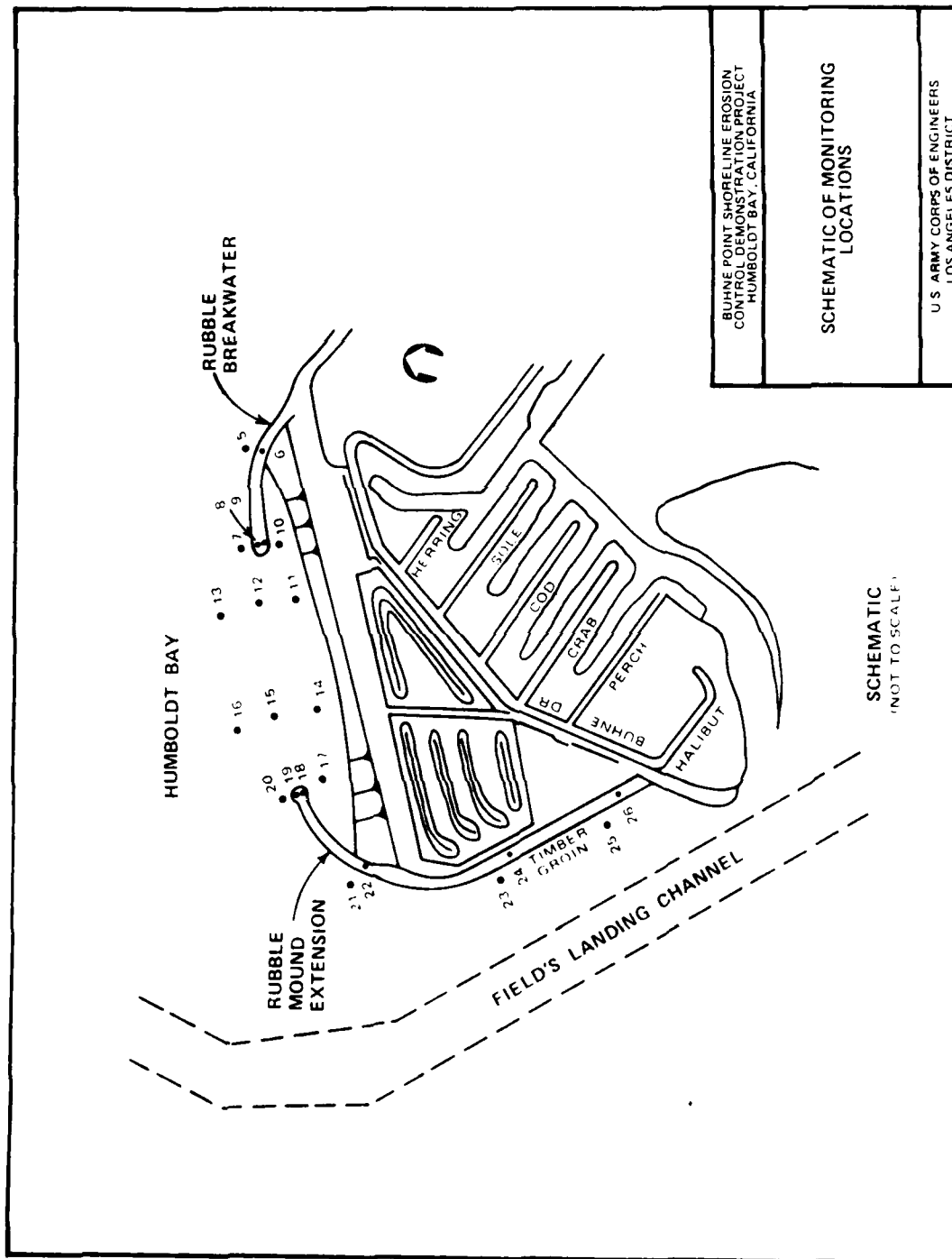


FIGURE 1

The remainder of this report consists of a discussion and refinements to the Revegetation Concept Plan and the environmental monitoring elements. These refinements were developed in response to comments arising during steering committee meetings and consultation with staff and environmental advisors to the county and Harbor District of Humboldt.

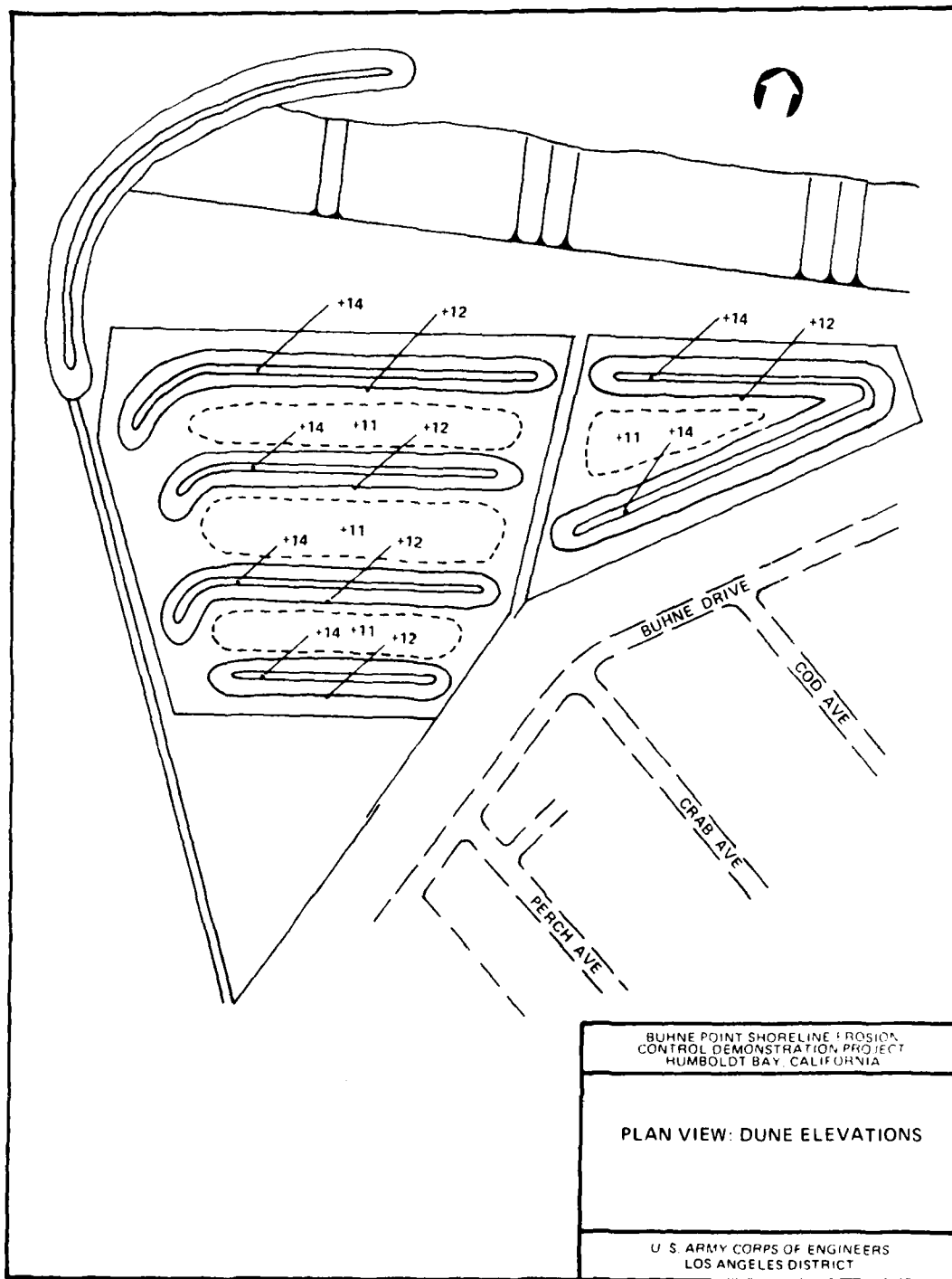
#### Sand Stabilization - Revegetation Program

The purpose of the Sand Stabilization - Revegetation Program is to prevent large volumes of sand from being blown about by the wind and to provide an attractive, low maintenance ground cover using native plant species.

A roughly triangular area of sand approximately 1,200 by 1,700 by 1,800 feet has been produced by the Phase II fill activities. This sand will be contoured according to detailed Plans and Specifications which will be developed later in the planning process, but which will generally result in a series of low ridges approximately 3-4 feet in height and spaced 40-50 feet apart, parallel to the shore. These ridges will have a maximum elevation of +14 feet MLLW; the swales will be at +11 feet MLLW (see Figure 2).

The fill material consists of medium to fine grained sand and shell fragments obtained from within the Corps maintained navigation channel along the north spit of Humboldt Bay. Once dried out this fill is subject to wind erosion, and unless some protection is provided the sand will blow over the project and onto the adjacent road and into residences. When unconsolidated sediments, in this case sand, are exposed to sufficient surface wind velocities (approximately 15 mph) the sand will begin to move, first by surface rolling, and then as surface wind velocities increase, by saltation (a bouncing hopping motion where collision with the surface results in more particles being moved). Where wind velocities are high and particle sizes small, the particles move in suspension for considerable distances. The first two processes, surface rolling and saltation, result in most of the transport on sand beaches. Because both of these types of movement occur in the first 12-24 inches above the sediment, it is possible to cause the moving sediment to settle out by causing a reduction in wind speed at or near the surface of the sand. Reduction of wind velocity can be caused by increasing surface roughness, and by putting up obstructions to the wind. In the case of this project, sand fencing, vegetation, and topographic alteration will all be used to reduce surface wind velocities. Wind breaks deflect and reduce wind velocities over distances proportional to their height and densities: effective wind velocity reductions occur over a distance approximately 4 to 10 times the height of the obstruction (for normal wind speeds 10-40 mph) behind the wind break. The best sand trapping devices have been found to be fences, bushes, and plantings with a ratio of open to closed space approximately 40-50 percent.

Vegetation is the method of choice for stabilizing blowing sand, but vegetation often requires several seasons to become established and functional. For this reason sand fencing will be installed after filling operations to provide initial sand trapping.



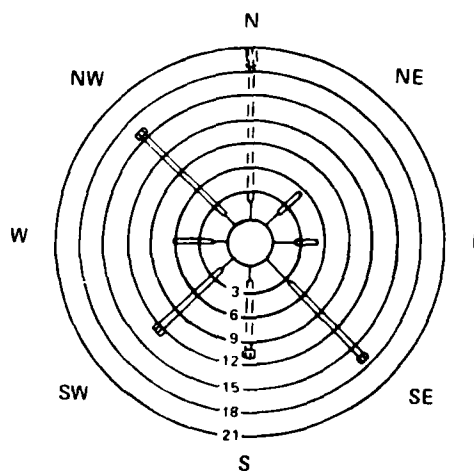
The best alinement for rows of wind reducing devices like sand fencing, brush rows and vegetation is perpendicular to the effective prevailing wind. This optimum configuration is not necessary and need only be roughly approximated. Effective prevailing wind is the resultant sum of all winds with sufficient velocity to move sand. This wind may be approximated by consulting wind records (as summarized in the wind rose, figure 3) for the area, or by observation of the dune topography. Both methods provide a NNW direction for prevailing effective wind in the project area.

Wind protection for Phase II is provided by a 4 foot high single row of sand fence (either the wire and slat type or the fabric type) which is parallel to the existing riprap seawall and will be set 100 feet from it to allow excavation of the existing sea wall in Phase III. Phase IV construction will require another 1300 feet of sand fence positioned as shown in Figures 4 & 5. The proposed plan will revegetate approximately 20 acres of sand, and install 2,800 feet of 3 strings of double stranded 12 gauge galvanized wire supported at 6 foot intervals by 9.5 foot posts. The fence wire shall be stretched and anchored at corners by 4 foot deep sand anchors. The areas within the protective fence will be planted as shown in figure 6.

# MONTHLY AVERAGE AND MAXIMUM WINDS

MONTH	MEAN WIND SPEED (MPH)	PREVAILING DIRECTION	MAXIMUM WIND SPEED (MPH)	DIRECTION
JANUARY	6.9	SE	54	S
FEBRUARY	7.2	SE	48	SW
MARCH	7.5	N	48	SW
APRIL	8.0	N	49	N
MAY	7.9	N	40	NW
JUNE	7.4	N	39	NW
JULY	6.8	N	35	N
AUGUST	5.8	NW	34	N
SEPTEMBER	5.5	N	44	N
OCTOBER	5.6	N	56	SW
NOVEMBER	6.0	SE	43	S
DECEMBER	6.4	SE	56	S
ANNUAL	6.8	N	56	SW
LENGTH OF RECORD (YRS)	54	54	67	67

(FROM U.S. DEPARTMENT OF COMMERCE 1977)



INCLUSIVE DATES  
July 1939-Dec 1942

TOTAL OBSERVATIONS  
9002

MILES PER HOUR

1-3, 4-15, 16-31

Hourly average surface winds (MPH), percentage frequency of occurrence (after U.S. Army Corps of Engineers, 1956).

FIGURE 3  
6

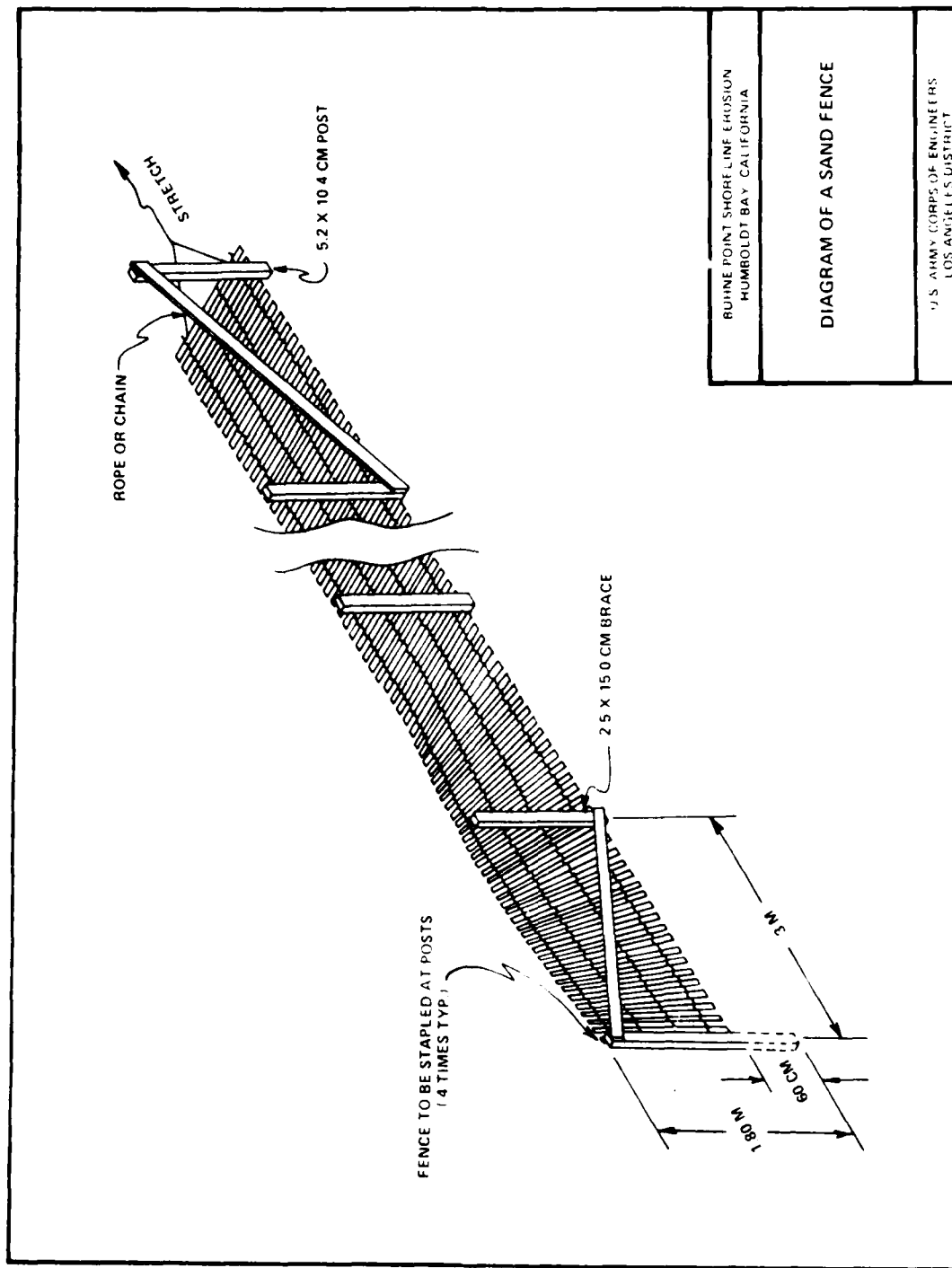


Installation of Slat Fence



1 Year of Sand Accumulation

Figure 4. Typical Sand Fence



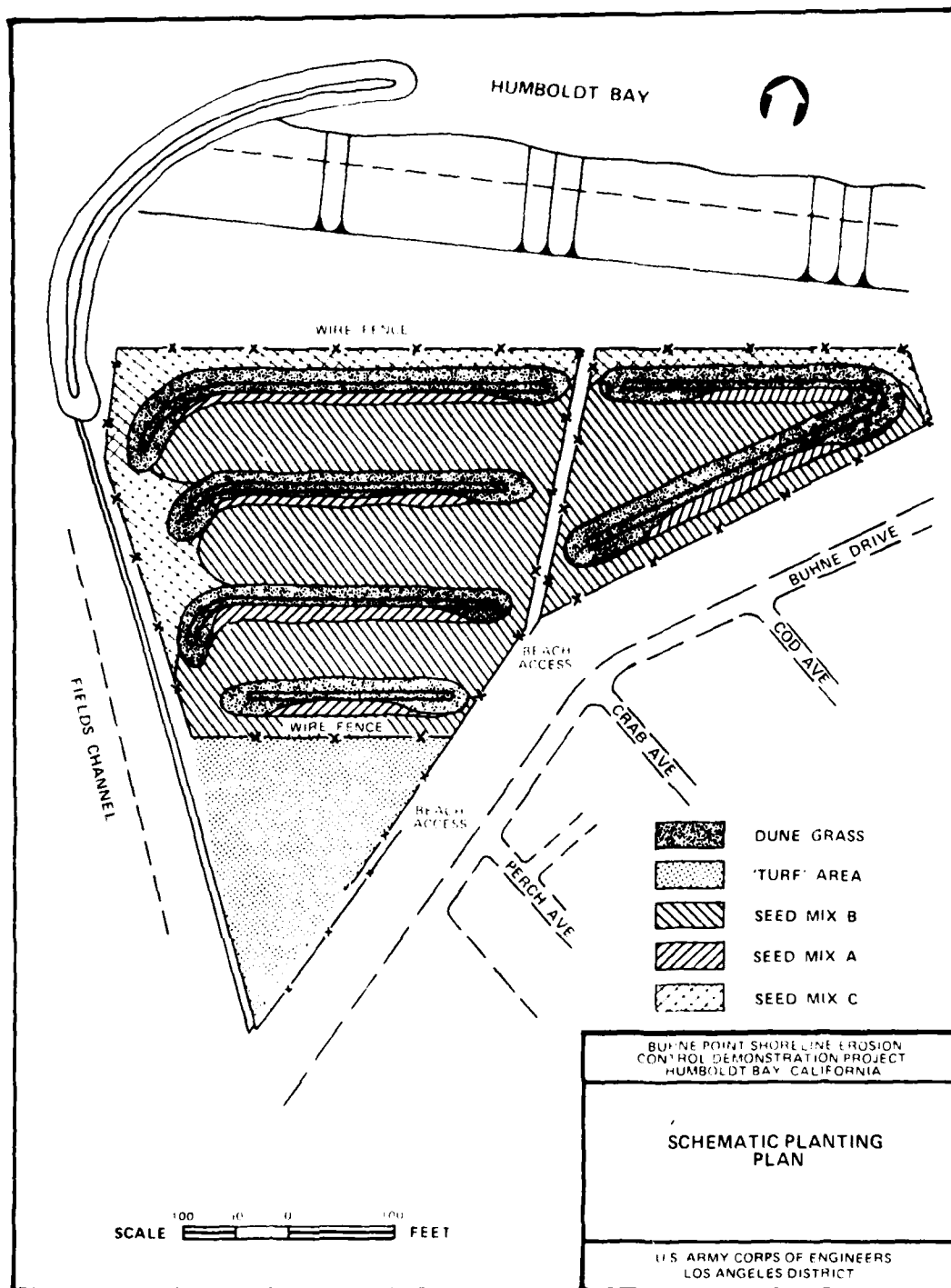
RUHNE POINT SHORE LINE EROSION  
HUMBOLDT BAY, CALIFORNIA

# DIAGRAM OF A SAND FENCE

U.S. ARMY CORPS OF ENGINEERS  
LOS ANGELES DISTRICT

FIGURE 5





Fence installation shall be accomplished by the Corps of Engineers, after all grading and contour work (December-January FY 85). Maintenance of the project during the two year monitoring period will be performed by the Corps.

#### Site Preparation

Prior to planting, final contouring will be accomplished by the Phase III Contractor to specifications provided by the Corps of Engineers. The following services will be provided by Humboldt Co. under services agreement with the Corps of Engineers: Soil samples will be taken and analyzed for salt content, sediment size distribution, nutrients, and field capacity. Areas to receive treatment, (mulch, fertilizer, special seed mixes, texturing etc.) will be staked and marked.

#### Seed and Plant Collection

One hundred pounds of pure live seed each collection period will be taken from plants of the species listed on table 1. They will be collected by the county under terms of a service agreement with the Corps of Engineers. The county will supply labor, and a qualified botanist or revegetation expert to supervise the collection and storage of plant materials and the sites for collection. Seed will be harvested, cleaned, processed and stored in a manner which will preserve seed viability. Records of each species collected will be kept and will include collection location, date, method of collection, stage of seed development. These records will be maintained by the designated supervisor and a collection number assigned to each species at each collection site, each bag of seeds will carry identifying labels. Seed will be collected three times during the project (see table 2). Assignments of areas to be planted will be determined after seed collection. Planting operations will be conducted in late fall (October, November) or in early spring (March, April) in Fiscal years 1985-1987 (see table 2).

Should the first planting attempt show adequate coverage after the first season no further seeding will be attempted. Some maintenance work will be required however. If, a second and possibly a third general seeding is required to assure good coverage, specifications for replanting will be provided by the Corps of Engineers which will reflect existing conditions. Seed collection will proceed as shown on table 2 regardless of site conditions. Seed not immediately required may be stored for up to one year. Specifications for storage will be provided by the Corps of Engineers.

Substitution of species or changes in amounts of seed collected will be allowed if prior approval is given by the Corps of Engineers Contracting Officer.

Species to be collected as sprigs (table 1) will be collected and stored in a cool dark room (56°F) or maintained in vermiculite beds or temporarily transplanted to field nursery sites. Only healthy viable sprigs will be accepted by the Corps Contracting Officer prior to planting.

Plant materials shall be selected from native and naturalized dune species and shall be harvested from local wild stock just prior to installation. Materials tentatively selected for planting include cuttings, sprigs and seeds from the following list:

PLANT SPECIES LIST  
TABLE 1

Genus Species	Common Names	PROPAGULE	Lb./Acre; Ft. O.C.			Total Units
			A	B	C	
1. <u>Ambrosia chamissonis</u>	Beach Bur	SE	3 lb	3 lb	3 lb	
2. <u>Artemisia pycnocephala</u>	Beach Sagewort	SE	3 lb	1 lb	3 lb	
3. <u>Baccharis pilularis</u>	Coyote Brush	SE	1 lb	3 lb		
4. <u>Erigeron glaucus</u>	Seaside Daisy	SE	1 lb	1 lb		
5. <u>Tanacetum douglasii</u>	Dune Tansy	SE SP	1.5 ft	1.5 ft		40,000
6. <u>Calystegia soldanella</u>	Beach Morning Glory	SE	1/2 lb	1 lb	1 lb	
7. <u>Cakile maritima</u>	Sea Rocket	SE	2 lb	3 lb	4 lb	
8. <u>Elymus mollis</u>	Beach Ryegrass	SP	1.5 ft	1.5 ft		58,080
9. <u>Poa confinis</u>	Blue Grass	SP	1 ft			*48,560
10. <u>Poa douglassi</u>	Douglas Blue Grass	SP	1 ft			*
11. <u>Lathyrus littoralis</u>	Beach Pea	SE	1 lb	1 lb	2 lb	
12. <u>Lotus micranthus</u>	Smallflowered Lotus	SE	3 lb	3 lb		
13. <u>Abronia latifolia</u>	Yellow Sand Verbena	SE	1 lb	1 lb	1/2 lb	
14. <u>Camissonia cheiranthifolia</u>	Beach Primrose	SE	2 lb	2 lb	1/2 lb	
15. <u>Fragaria chiloensis pacifica</u>	Beach Strawberry	SP	2 ft	2 ft		10,890
16. <u>Eriogonum latifolium</u>	Seaside Buckwheat	SE	5 lb	5 lb		
17. <u>Salix hookeriana</u>	Hookers Willow	SP	4 ft	4 ft		2,700
18. <u>Salix piperi</u>	Sandbar Willow	SP	4 ft	4 ft		2,700
19. <u>Myrica californica</u>	California Wax Myrtle	G				50
20. <u>Lupinus chamissonis</u>	Blue Bush Lupine	SE	1 lb	3 lb		

SE = seed      SP = sprig      G = Gallon containers

\* 48,560 units of Poa confinis or P douglassi

Sprigged areas will be planted to Corps specifications. Special treatment areas will be hand seeded and raked in. General seeding will then be undertaken, in conjunction with hydro-mulching or some other suitable surface control method. Should seed availability limit the area of general seeding the areas nearest the road will be planted first, successive seeding operations will then progress seaward. Contoured ridges will have priority for sprigging. Planting plans will have to remain flexible until the results of seed collection and seed purchase for each planting period are known.

#### Monitoring Program

The major objective of the monitoring program is to document the performance of the project and its impact on the nearshore zone surrounding the project. In addition, this particular program will give the Corps of Engineers an opportunity to study a uniquely designed project from its completion through the first two years of its effective life.

#### Beach Vegetation Monitoring

The purpose of the beach vegetation monitoring element is to assess the efficiency of the vegetation in stabilizing blowing sand, and to provide recommendations for repair and maintenance.

Twenty plots will be designated to study the efficiency of sprigged vegetation in stabilizing sand at the beginning of the study. These plots will then be surveyed once every six months for two years to assess increases in shoot numbers, root depth, area of coverage, sand accumulation, effect on wind pattern and velocity, length and number of tillers. Hydro-seeded areas will be surveyed to determine seed inoculation rates by placing survey plates in each of three seed areas. Where areas are hand seeded, twenty, one-square meter plots will be sampled, the seed separated from the sand, and enumerated by species. Tests for viable seed will be conducted to determine actual numbers of live seed planted. Seed germinations will be monitored at designated plots every week during the first month then twice the following month then once every other month for the rest of the monitoring program. Plots in the seed areas will be surveyed for numbers of germinations, coverage, sediment trapping, root depth, plant development for each of the planted species. Climate and soil characteristics which affect plant growth and development will also be monitored. These include rainfall, depth to water table, soil nutrients, salt spray, wind speed and direction, and soil temperature at the surface and at depth.

Insects will be collected and identified during each sampling period and associated with microhabitat and niche requirements. Insects pollinators of the various plant species will be noted as will any significant plant pests. Any evidence of mammal grazing on plants will be documented and live trapping conducted to determine species involved. Removal and relocation of any mammals significantly reducing growth of vegetation will be accomplished.

Replanting and restoration work will be undertaken; repair and maintenance work will be accomplished on sand fences, during surveys. Problems with plant growth or the functioning of sand fences will be noted and corrected. Approximately 25 percent of the original installation costs should be budgeted for repair and maintenance for the first 2 years.

## Benthic Monitoring

The best designed projects often cause unanticipated adverse impacts to natural resources. The following monitoring program was developed to detect any significant changes in benthic invertebrate animal populations early in the project's life and to provide necessary information to alleviate any significant deterioration of natural resources in Humboldt Bay.

The area surrounding Buhne Point has been identified in research literature as important feeding areas for black brandt (*Branta nigricans*) (17), beds for gaper clams and other prized bivalves (5), nursery grounds for dungeness crabs and fish including herring (1), top smelt and various flat fish (3). All of these natural resources depend upon shallow mud flats and eel grass beds (23). These habitats are particularly sensitive to changes in wave climate and tidal currents. The proposed project is designed to reduce wave energy impinging on Buhne Point and to prevent transport of sand from along Buhne Point into Fields Landing channel and onto the tidal flats south of Buhne Point. Potential adverse changes which may reasonably be expected to occur include scouring due to locally increased currents, erosion of benthos and inhabiting organisms where the project reduces transport of sediment. Fluctuating natural changes in the shallow benthic community occur frequently. However, progressive unidirectional changes may occur as a result of this project. Changes, predicted in the project's environmental assessment, are not considered significant, but actual project effects often differ from predicted effects. Given the sensitivity and importance of the local resources a monitoring program has been incorporated into the project to determine early directions, extents and consequences of project induced changes on the local benthic habitats.

The area anticipated to be affected by the project will be sampled at 26 stations whose locations are schematically shown on figure 1. Samples of nearshore benthic fauna will be taken by divers from stations 1, 2, 3, 4, 5, 7, 10, 11, 12, 13, 14, 15, 16, 17, 20, 21, 23, and 25. Each station will require at least 5 replicates each sampling period (2 each year). Each replicate will consist of a one liter benthic push core. Macroinvertebrates will be sampled by diver operated pneumatic dredges. Each replicate sample will be analyzed to determine numbers of each species present of the 10 most abundant species and note the occurrence of less abundant species. Stations, 6, 8, 9, 18, 19, 22, 24, 26 which are located at various points on the breakwater will be sampled by sequentially removing one to several settlement plates for species enumeration. In addition photographic records will be taken at designated sites to document species settlement and change through time.

Stations 1-6 will be used as controls and shall be located at a location with a similar bottom and exposure to the project site. Changes in species composition and numbers at control sites will be used to gauge changes in species numbers and composition at the project sites.

All replicate samples will be seived then fixed in the field with buffered formalin. All replicates will be uniquely labeled with replicate number, station time and date. Processed specimens will be analyzed by a qualified local marine benthic taxonomist. Data will be accumulated, reduced and analyzed by Corps of Engineers biologists.

Location and extent of clam beds and eel grass near the project will be mapped and monitored, sediment samples will be taken and analyzed to detect changes in sediment, size distribution. Sediment accumulation or erosion within important habitat types will be measured and documented.

A report of the results of the monitoring program will be produced in FY 87 and will include discussions on the following: (1) effectiveness of the sand stabilization methods; (2) relative effectiveness of various species in stabilization; (3) performance of the project in reducing wind blown sand; (4) species germination growth and development rates; (5) recommendations for the protection of significant benthic habitat near the project area from any unanticipated project effects; (6) quantitative data on benthic invertebrate populations; (7) quantitative and photographic records of plant and animal growth on breakwaters; and (8) documentation of project effect on the benthic fauna near the project area.

Buhne Point

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## **SECTION 2**

### **SUMMARY REPORT-ENVIRONMENTAL ELEMENTS**

SUMMARY REPORT  
BUHNE POINT  
SHORELINE EROSION DEMONSTRATION PROJECT  
ENVIRONMENTAL ELEMENTS

LOS ANGELES DISTRICT  
US ARMY CORPS OF ENGINEERS  
May 1987

#### PREFACE

This report was prepared for the Construction-Operations Division of the San Francisco District, US Army Corps of Engineers by the Environmental Section, Los Angeles District, US Army Corps of Engineers. It provides a summary of findings based on reports provided by the Los Angeles District's contractor, Humboldt County and its subcontractors. The information contained herein is derived solely from those reports which are summarized in the annotated bibliography found in Appendix A. The reader is referred to these reports, obtainable from the San Francisco District or Humboldt County, for details and a full accounting of the dune vegetation portion of the Buhne Point Demonstration Project constructed by the San Francisco District, US Army Corps of Engineers.

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Ecologist  
Environmental Section

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### APPENDIX A: ANNOTATED BIBLIOGRAPHY

## 1.0 INTRODUCTION.

Buhne Point in South Humboldt Bay, California has experienced severe erosion on its bayward margin. This erosion has been attributed to dredging and shore protection activities at the bay entrance. Wave attack has damaged the only public access road to the adjacent community of King Salmon. The Federal Highway Administration in cooperation with the US Army Corps of Engineers, the Humboldt Bay Harbor District and the county of Humboldt developed a plan to restore and stabilize the sandy spit at Buhne Point. The restored spit would provide protection to the Federal Highway, a public beach and would restore habitat for migratory birds, recreationally important fish, and shellfish.

The project was built in four phases. Phase I, designed and constructed by Humboldt County, consisted of construction of a timber groin whose purpose was to stabilize the Phase II sandfill and prevent this material from being transported downcoast (south) into Fields Landing Channel. Phase II of the project, designed and constructed by the Corps of Engineers consisted of restoring the sand spit at Buhne Point. The sandfill material was excavated by hydraulically dredging 600,000 cubic yards from a borrow area located along side the Humboldt Bay entrance channel and forming a 24-acre landfill upcoast (north) of the Phase I timber groin and along Buhne Drive (fig. 1). The crest elevation was originally 15 feet above mean lower low water (MLLW) to reduce erosion impacts that would have occurred prior to Phase III. The material was later spread out during Phase III construction to 12 feet MLLW. During Phase III measures were performed to insure longterm stabilization of the sandfill. These measures included: placement of rock revetment along the downcoast face of the Phase I timber groin, a rubble mound extension of the timber groin, and a rubble mound breakwater connected to the upcoast end of the sandfill (fig. 2) to prevent wave erosion and sand fences to reduce wind erosion of the sandfill. Phase IV consisted of the sand stabilization/revegetation and the monitoring program. The monitoring program included hydrographic foreshore surveys, aerial surveys, sand sampling and analysis, a Littoral Environmental Observation Program, and a Biological Monitoring Program.

The remainder of the report addresses the revegetation effort and the biological monitoring efforts.

## 2.0 REVEGETATION STUDIES.

### 2.1 Purpose and Goals.

The primary purpose of the revegetation portion of the Buhne Point Shoreline Erosion Demonstration Project was to prevent large volumes of sand from the newly created sand fill from being

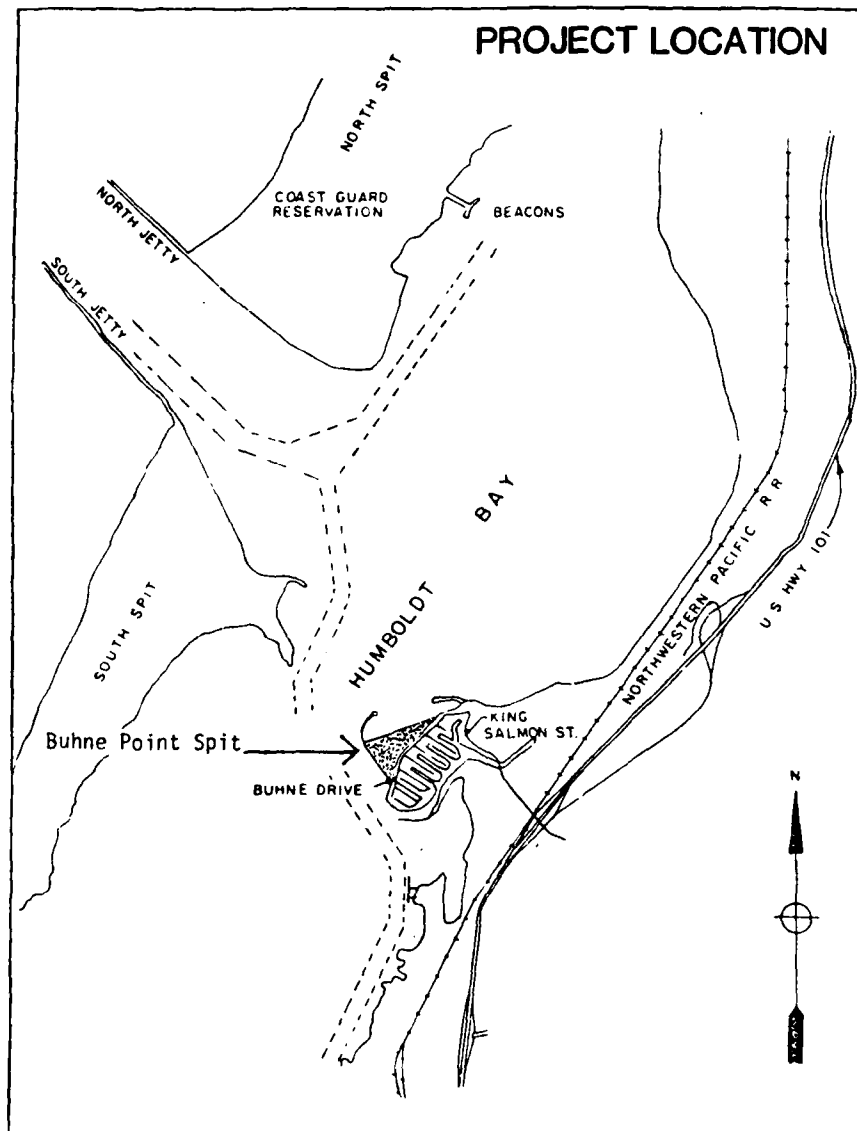
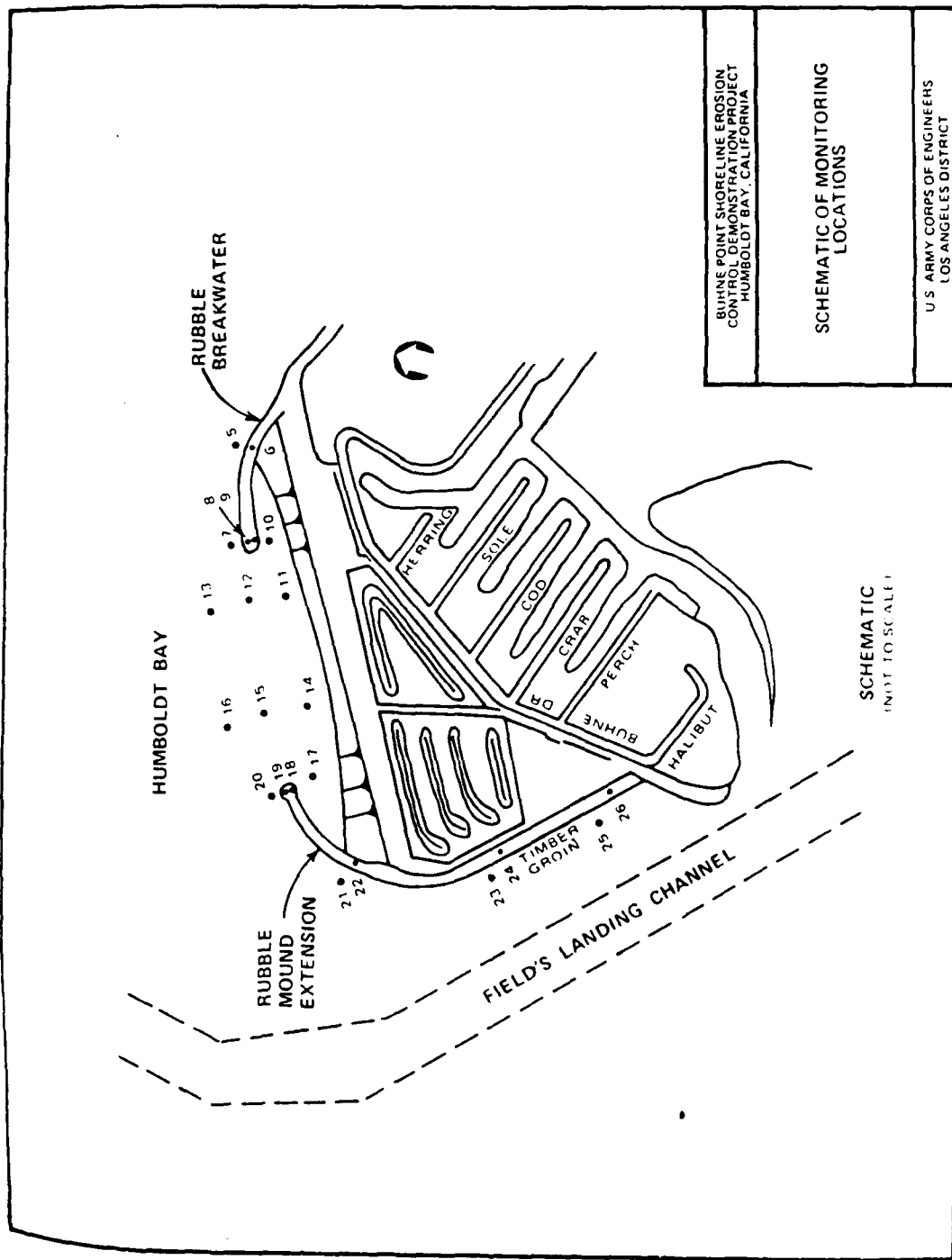


Figure 1: Project Site Location





BURNE POINT SHORELINE EROSION  
CONTROL DEMONSTRATION PROJECT  
HUMBOLDT BAY, CALIFORNIA

SCHEMATIC OF MONITORING  
LOCATIONS

U.S. ARMY CORPS OF ENGINEERS  
LOS ANGELES DISTRICT

FIGURE 2

blown about by the wind. The goal was to reduce erosion by providing an attractive, low maintenance ground cover using native plant species in conjunction with other measures, such as sand fencing and topographic alteration, to reduce surface wind velocities. Reduction in wind velocities would then result in a reduction of sand moving off the sandfill.

The secondary purpose was to develop a revegetation monitoring plan that would enable objective evaluation of the program's success and provide meaningful information on planting techniques, time and costs to guide other beach and dune revegetation projects.

## 2.2 Background.

A roughly triangular area of sand approximately 1,200 by 1,700 by 1,800 feet was produced by the Phase II fill activities. The fill material consisted of medium to fine-grained sand and shell fragments. The sand was contoured to result in a series of low sand ridges, parallel to shore, spaced 40 to 50 feet apart and approximately 3 to 5 feet high. The ridges had a maximum elevation of 14 feet MLLW and the swales a minimum elevation of 11 feet MLLW (fig. 3).

Sand fencing was installed prior to revegetation efforts to reduce wind velocities and increase overall substrate stability and trap moving sand. Sand fencing was aligned perpendicular to the effective prevailing wind which was determined to be North Northwest (NNW) in the project area. The sand fence consisted of a 4-foot high single row of wooden slat fence; one was set parallel to but 100 feet from the existing sea wall and another positioned around the revegetation area (fig. 4). The sand fence also discouraged people and dogs from trampling the revegetation area.

Planting of the dune area was accomplished in several phases; these phases should not be confused with the phases of construction outlined in the introduction above. The purpose of the first phase was to determine the cost, man-hours, procedures, and equipment necessary to establish permanent native plant cover sufficient to stabilize the dune area. The pilot phase, conducted in Spring 1985, is documented in "Phase One Planting: Methods and Cost Analysis, Buhne Point Shoreline Erosion Demonstration Project."<sup>1</sup>

The Phase One plantings established native dune grass (*Elymus mollis*) on the windward sides and tops of Dunes II, III, IV, and part of Dune V (fig. 4) using culms from stocks imported from Oregon. Large seeding beds behind the dunes were sowed with

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<sup>1</sup> County of Humboldt, Department of Public Works, Natural Resources Division, 1106 Second Street, Eureka, California. May 30, 1985. Gail Newton, Botanical Consultant, Eureka, California.

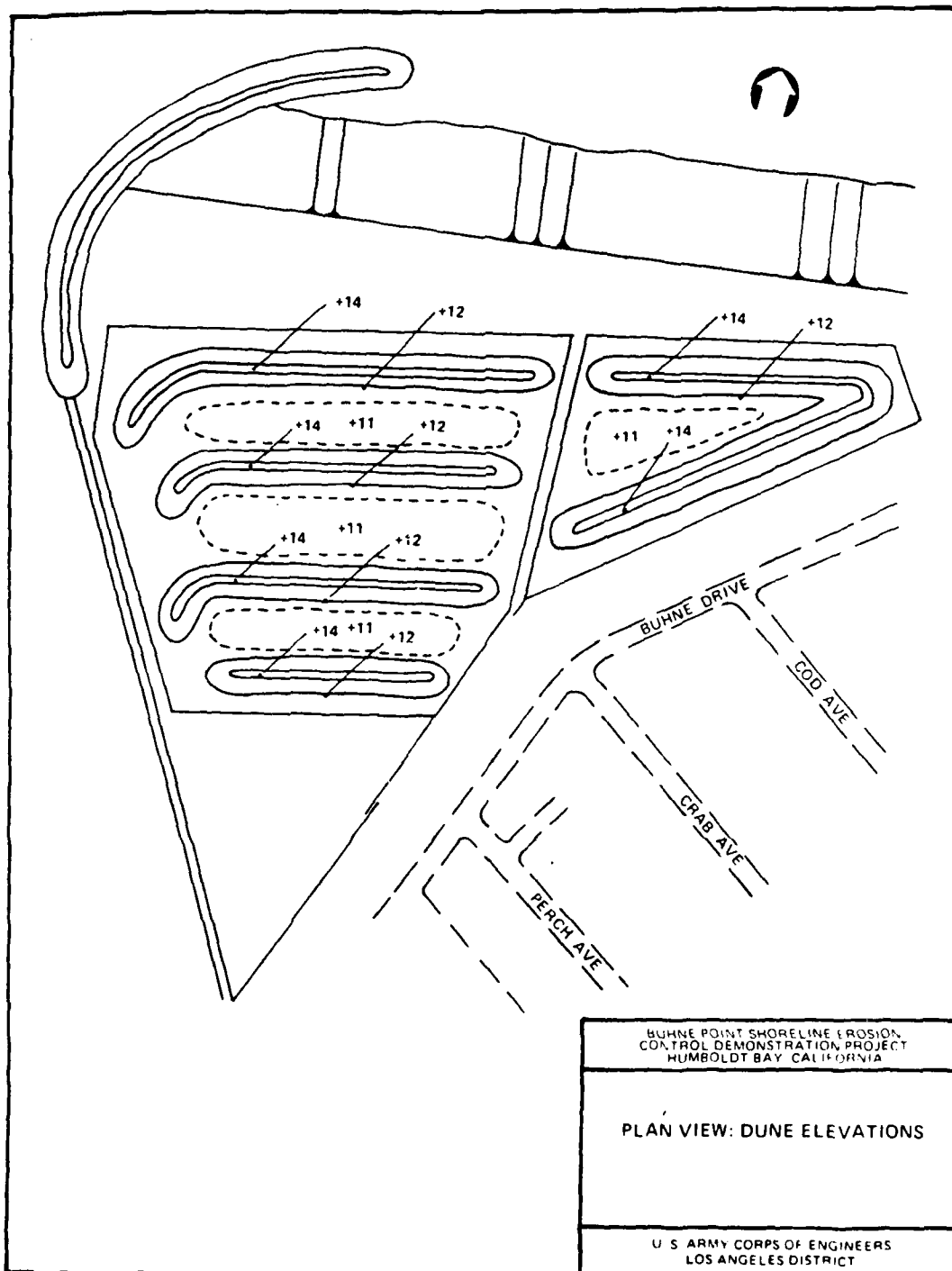


FIGURE 3

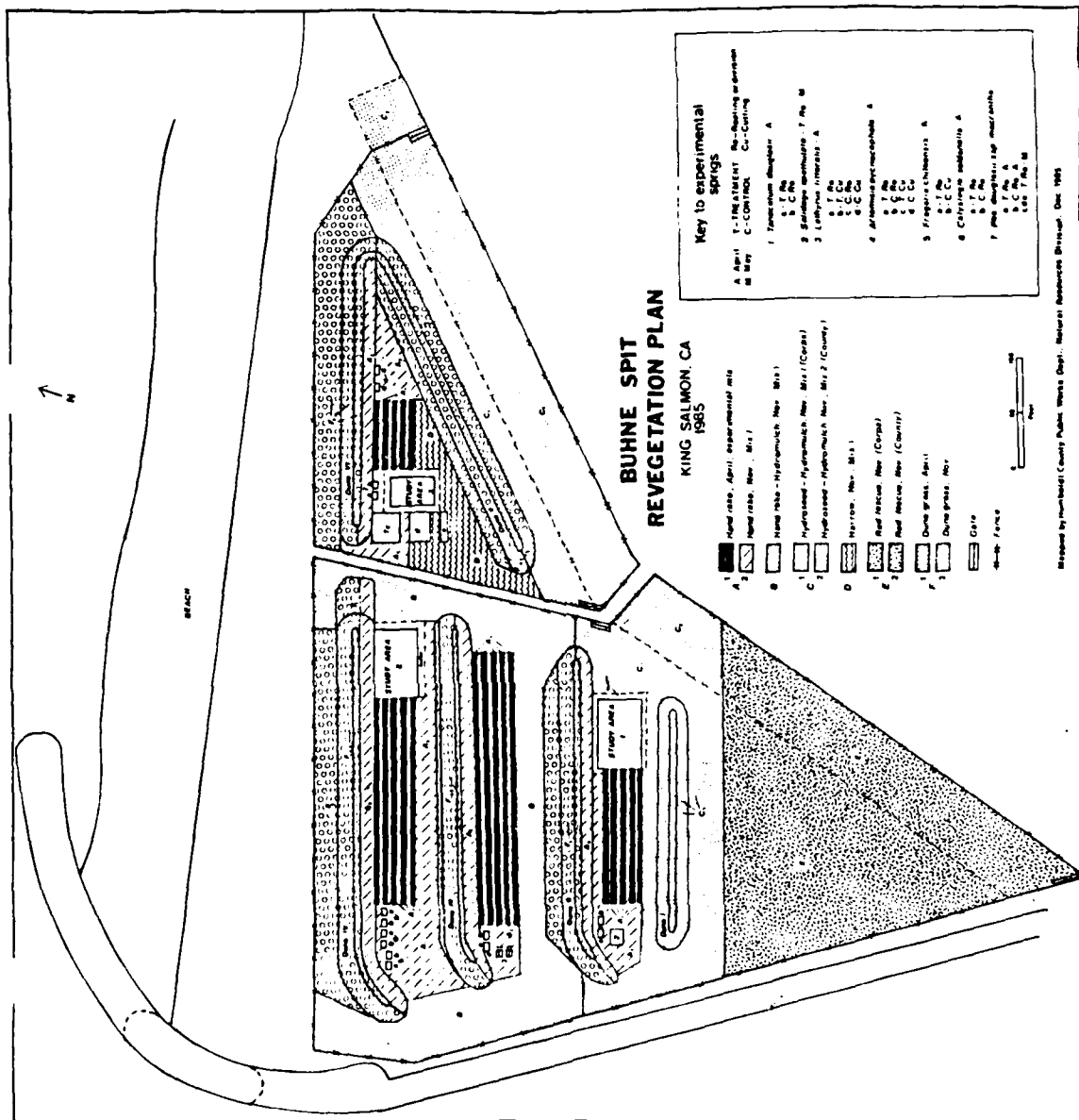


Figure 4: Revegetation Plan Showing Locations of Study Areas 1 and 2, and Vegetative Propagule Treatment Plots.

locally collected seeds of other native plants and small areas were set aside as vegetated propagule and treatment beds.

Phase One consisted of experimental plantings designed to test revegetation methods. Both quantitative and qualitative methods were used to evaluate the success of different native species and treatments. Two study plots were used to quantitatively examine the effect of nine treatments on germination, survival, and first year foliar cover of each of the native species. Treatments consisted of soluble and slow-release fertilizers, compost, jute matting, hydromulch/fertilizer, and three different seed application rates and a control (no treatment) situation. All treatments, including control, were irrigated. Nine species were planted: yellow sand verbena (Abronia latifolia); beach primrose (Camissonia cheiranthifolia ssp. cheiranthifolia); beach bur (Ambrosia chamissonis); seaside buckwheat (Eriogonum latifolium); beach morning glory (Calystegia soldanella); seaside daisy (Erigeron glaucas); dune tansy (Tanacetum douglasii); beach pea (Lathyrus littoralis); and beach sagewort (Artemisia pycnocephala).

Based on the Phase One results, the Phase Two planting plan was implemented in Fall 1985 to vegetate the remaining portions of the dune and back dune areas. This phase is documented in "Phase Two Planting: Methods and Costs, Buhne Point Shoreline Erosion Demonstration Project."<sup>2</sup> Phase Two utilized techniques developed in Phase One or implemented refined strategies and techniques arising from difficulties encountered in Phase One. During Phase Two, portions of the unplanted areas behind the dunes were seeded with native dune species utilizing several treatments. The use of four different treatments facilitated objective comparison of relative success and cost per area of sowing native seeds. The treatments used included: hand-raking, hand-raking and using hydromulch with slow-release fertilizer; hydroseeding with hydromulch; and using tractor harrow to sow seed to proper depth.

### 2.3 Conclusions of Vegetation Studies Performed for the Corps of Engineers.

The conclusions presented here are derived directly from reports cited in the annotated bibliography (Appendix A). This report consolidates some of the information derived from these studies which may be used in other dune restoration or revegetation projects. Details of study methodology, analysis, results, and conclusions should be obtained from the referenced reports. The conclusions derived from these reports are loosely grouped in accordance with their relevance to different phases of a restoration/revegetation effort.

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<sup>2</sup> County of Humboldt, Department of Public Works, Natural Resource Division, 1106 Second Street, Eureka, California. May 19, 1986. Bio-Research, Inc. Ferndale, California.

### 2.3.1 Site preparation.

Perimeter fencing should be maintained until a dense dune mat community has fully developed.

Pedestrian, animal (especially dog), and motor vehicle access to areas should be restricted to paths. Dog access should be completely restricted, if possible.

Based on Phase One, the recommended planting method, for the Buhne Point site and probably for other similar situations, is hydromulch applied with 20 lbs/acre seeds, 2000 lbs/acre mulch and 300 lbs/acre Osmocote 13:13:3 or other slow-release fertilizer. Regular irrigation (during the dry season) and the use of slow-release fertilization and mulch will reduce fertilizer-induced inhibition of germination. Hydromulch is recommended because of its moisture-relating properties and overall cost effectiveness. Hydromulch also acts to stabilize the substrate. However, slow-release fertilizer treatments were superior over other treatments in the long term (over two years). Its superiority was more clearly demonstrated in the second year when foliar cover increased significantly. This is due to its extended nutrient release period. Reapplication of soluble fertilizers in the second year would probably reduce the margin of the superiority of slow-release fertilizer.

Use of hydromulch may accidentally result in introduction of non-native grasses to the site through contamination of the slurry by residues of previous hydromulch applications. Therefore, extreme care must be taken to ensure that the mulch tank is thoroughly cleaned.

The optimum rate of fertilizer application that will encourage native species' growth while discouraging weedy species should be determined with pilot studies.

If preliminary results indicate that the substrate is deficient in nitrogen, annual fertilization with ammonium sulfate should occur until adequate organic matter accumulates and nitrogen is no longer limiting.

The tractor and harrow method worked best when the area to be sown was completely flat and the sand wet and compacted.

The rate at which seeds are sown is critical; Phase One used a application rate of 20 pounds per acre. Too low a rate will result in too few plants to cover the area. Too high a rate will increase competition among plants and may reduce the size and quality of surviving plants (which happened in Phase Two when an application rate of 25 pounds per acre was used). The rate of sowing can be estimated if the percent germination, percent purity, and the number of live seeds per pound are known. Since

these parameters are often not known for native dune species, the application rate for each species can be determined using:

- 1) The monoculture application rate suggested by commercial seed companies for the same or closely related species, or as a last resort, for similarly sized seeds;
- 2) General information on germination rates; and
- 3) Pounds of seeds collected for planting.

The following formula was used:

$$\frac{\text{pounds of species in mix} \times \text{monoculture application rate}}{\text{combined monoculture application rate of all species}} \times \text{total pounds of mix}$$

When developing seed mixes, both the recommended monoculture application rate and the resulting poundage of seed for each species applied per acre should be accounted for. A small change in the monoculture application rate and/or a change in the number of species in the mix will correspondingly change both the ratio of each species within the mix and the resulting pounds per acre.

Design of the irrigation system should take into account predominant wind direction and speeds. This is especially important when using aerial irrigation methods on beach or dune sites where wind exhibits consistent speeds and direction.

#### 2.3.2 Seed and Plant Selection, Collection, Handling and Planting.

Species which continue to grow through periods when other plants lose their above ground foliar cover are desirable owing to their ability to stabilize sand.

The maximum number of species should be used in revegetation efforts to provide a diverse ecologically valuable vegetative community. There is, however, a limit to the number of species that can be sown in the same mix.

Collection of seeds from the local eco-region is highly recommended over the purchase of commercial seeds in order to protect local genetic strains and prevent accidental introductions. In addition, local plants are more attuned to local environmental conditions and thus, have a higher probability of survival under the local conditions.

Collection of vegetative propagules should be from sites which exhibit vigorous populations. Collection should be from several sites so as not to over-collect from one site and to add genetic variation to the stock used on the restoration site.

Extreme care should be taken to ensure that native dune grass (Elymus mollis) and not European beach grass (Ammophila arenia) is planted. Culms can look extremely similar and removal of the exotic grass can be both expensive, time-consuming, and difficult to completely accomplish.

The outer leaves of the native dune grass (Elymus mollis) do not have to be stripped away from the culms to expose the rooting nodes as the grass produces roots that can penetrate the outer leaves. Keeping the outer leaves intact may help to protect the delicate nodes from physical damage during planting.

Planting of seedlings and sprigs should be accomplished in the early winter months, i.e., before winter rains, to increase their survival rate. Areas planted in spring required watering for germination and growth. Irrigation was only required during the dry season. Implementation of this finding should be based on climatic similarity to the Buhne Point, Humboldt County, coastal conditions.

Propagules should be treated with root hormone or fertilizer. The differences in survival or foliar cover that root hormone may result in was not tested statistically in these studies.

It may be possible for some species to retain useful levels of viable seeds for a period of over one year if seeds are treated with fungicide and insecticide and stored in air tight containers and controlled temperatures.

#### Notes on Individual Species:

Beach morning glory (Calystegia soldanella), due to low germination rates and cover values, is not recommended for use until a successful dormancy treatment is found.

Yellow sand verbena (Abronia latifolia) is the easiest plant to collect, although collections were contaminated with other species. Collections should compensate for the large numbers of empty fruit that will likely be collected.

Beach bur (Ambrosia chamissonis) is easy to collect in large quantities, however, hand protection is necessary.

Beach sagewort (Artemisia pycnocephala) can be collected by gathering the inflorescences; however, lengthy processing time yields few fruits (seeds). This species proved to be very competitive.

Beach pea (Lathyrus littoralis) seeds require scarification. Newton (1985b) found that seeds that had been released from ripe pods which had opened up and released seed onto the sand exhibited a brick-red coat were easier to scarify. Seeds that are easier to scarify and therefore more consistently



mechanically scarified may exhibit better germination rates and would therefore be better candidates for collection.

#### 2.3.3 Maintenance and Monitoring.

To maintain a native plant community, a regularly scheduled exotic species eradication program may be necessary. European beach grass (Ammophila arenia) out-competes native species and must be removed.

The number of herbivorous insects continued to increase throughout a three season (1 year) study in 1985. This is presumably a reflection of increased plant biomass. Seasonal fluctuation of pollenating insects was observed.

#### 2.3.4 Cost Information.

Prediction of costs associated with seed collection and processing is difficult due to high variability of several factors including site availability for collecting, the collector, the processing methods, and the abundances of species within a given growing season.

Use of four-wheel drive tractors for sowing seed is recommended to reduce down-time and costs associated with getting stuck in the sand.

Planting activities are labor intensive. Use of the California Conservation Corps should be explored as a means of reducing labor costs. Getting laborers for \$8.00/hour, the estimated cost of labor, may be extremely optimistic and probably is dependent upon local economic conditions and availability of a labor source. Costs for Phase Two plantings are broken down by method in Table 1.

### 3.0 BENTHIC STUDIES.

#### 3.1 Purpose and Goals.

A benthic monitoring program was conceived to identify any significant changes in the benthic invertebrate community that may have resulted from the construction or design of the demonstration project as the area surrounding Buhne Point supports several significant resources.

#### 3.2 Background.

Humboldt Bay is an important feeding area for black brant (Branta nigricans), it supports numerous beds of gaper clams and other bivalves, it is a nursery area for commercially important dungeness crabs and fish such as herring, and it supports top smelt and a variety of flat fish species. All of these resources

TABLE 1: PLANTING TIME AND COST SUMMARY

	Planting technique (does not include cost of propagules)						
	F DUNE CRASS	A HANDRAKE	B HANDRAKE- HYDROMULCH	C HYDROSEED- HYDROMULCH	D HARROW	E TUFF HYDROSEED	TOTALS
Area (acres)	2.01	1.64	1.26	1.91	0.30	1.50	7.27
Planting labor, man-hours/acre	110.53(a)	25.55	25.50	0.00	2.50	0.00	
1. Planting labor @ \$8 per hour	\$1,777.36	\$335.20	\$257.04	0.00	\$ 7.12	0.00	\$2,376.72
2. Other labor @ \$8 per hour(b)	80.96	34.16	26.16	0.00	0.00	0.00	141.28
3. Supervisor @ \$17 per hour	207.57	257.04	224.23	187.34	57.63	4.76	938.57
4. Equip. & mtl's.(c)	8.50	28.09	2,982.71	3,799.87	75.16	3,064.03	9,958.36
Projected cost w/o CCC's (1+2+3+4)	\$2,074.39	\$654.49	\$3,490.14	\$3,987.21	\$139.91	\$3,068.79	\$13,414.93
Actual cost w/ CCC's (3+4)	\$216.07	\$285.13	\$3,206.94	\$3,987.21	\$132.79	\$3,068.79	\$10,896.93
Planting labor, cost/acre @ \$8 per hour	\$884.24	\$204.40	\$204.00	\$0.00	\$20.00	\$0.00	
Project cost/acre w/o CCC' (1+2+3+4)	\$1,032.03	\$399.08	\$2,769.95	\$2,087.54	\$466.37	\$2,045.86	\$1,845.24
Project cost/acre w/ CCC's (3+4)	\$107.50	\$173.86	\$2,545.19	\$2,087.54	\$442.63	\$2,045.86	\$1,498.89

(a) This figure would have been 86.70 using the row-marking tool only; 10,890 hills/acre.

(b) Project-variable tasks: orientation, tool & equipment organization, walking to & from vehicle access.

(c) These figures are actual costs pro-rated for areas B, C & E, and would have been lower if original specified application rates & costs were used for hydromulcher and fertilizer (see text p. 13).

depend upon shallow mudflats and eel grass beds which are particularly sensitive to changes in wave climate and tidal currents. The conceptual goal of the benthic monitoring studies, as originally proposed, was to detect any significant changes in benthic invertebrate populations early in the project's life and to provide necessary information to alleviate any significant deterioration of natural resources in Humboldt Bay.<sup>3</sup> While, the Buhne Point demonstration project was designed to reduce wave energy and to prevent transport of sand from along Buhne Point into Fields Landing channel and onto the tidal flats south of Buhne Point, no significant changes to project area were predicted in the Environmental Assessment regarding this construction project. A monitoring program was proposed and incorporated into the Buhne Point Demonstration Project due the environmental sensitivity of the area and the potential that the project could result in unanticipated adverse impacts.

The purpose and goals of the benthic studies changed in response to changes in the implementation schedule which precluded scientific conclusions based on pre- and post-construction monitoring as construction begun prior to initiation of pre-construction benthic monitoring. The purpose and goal of the monitoring was altered in response to the absence of a before project situation against which to monitor changes. The goal became to document the recolonization of the filled area by invertebrates and to compare these areas to nearby "reference" areas within Humboldt Bay. A scope of work including quantitative studies of benthic invertebrates was prepared to address the revised goals and purposes of monitoring. Several proposals, all of which significantly exceeded the budget for such studies, were received. The contract scope was significantly reduced and a second request for proposals planned. However, the passing of two years since construction precluded making any significant scientific conclusions regarding effects the project may have had on the local environment. In light of the cost (\$10,000) and the questionable meaningfulness of the benthic studies, these studies were abandoned.

#### 4.0 SUMMARY.

Little wind blown sand was reported in the streets adjacent to the sand fill. Based on this qualitative observation, it appears that placement of native plants and grasses via seed or propagation on a sand fill created from dredged material has proven to be a relatively inexpensive means of stabilizing blowing sands. Plants survived best when treated with slow release fertilizer and irrigation during the dry seasons. Further studies on the ability of species to colonize unvegetated

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<sup>3</sup> US Army Corps of Engineers, Los Angeles District. Buhne Point Shoreline Erosion Demonstration Project: Environmental Elements. Concept Report. December 1984.

areas of dunes from restored areas need to be performed to fully establish the merits of native plants as stabilizers of wind blown sands.

#### APPENDIX A: ANNOTATED BIBLIOGRAPHY

Bio-Flora Research, Inc. 1986. Phase Two Planting: Methods and Costs. Buhne Point Shoreline Erosion Demonstration Project. Prepared for County of Humboldt, Department of Public Works, Natural Resources Division.

This report identifies collection, processing, and planting techniques implemented for culms of the native dune grass (*Elymus mollis*). Seed mixing, treatment, application and sowing techniques utilized in the full-scale Phase Two of the project are discussed. Planting times and costs are identified.

Clark, K. 1987. Soil Nutrient Analysis, Beach and Dune Nutrient Cycling Fertilizer Use and Long-Term Management Recommendations. Buhne Point Shoreline Erosion Demonstration Project. Submitted to County of Humboldt, Department of Public Works, Natural Resources Division.

This report contains data on soil nutrients after implementation of the project. This report was not reviewed by the Los Angeles District Corps of Engineers.

Newton, G. 1985a. Seed Collection. Buhne Point Shoreline Erosion Demonstration Project. Prepared for County of Humboldt, Department of Public Works, Natural Resources Division.

Results of seed collection for Phase One. This report documents the cost, man-hours, and procedures necessary for collecting, processing, and storing seeds from local native dune plants that could be used to vegetate the artificial dunes. Information is provided for 16 species. On the basis of these costs, predictions of the time and costs for the full scale (i.e., Phase Two) project were made.

Newton, G. 1985b. Phase One Planting: Methods and Cost Analysis. Buhne Point Shoreline Erosion Demonstration Project. Prepared for County of Humboldt, Department of Public Works, Natural Resources Division.

This report documents the results of experimental plantings of seeds and vegetative propagules and reports costs, man-hours, procedures, and equipment necessary to establish a cover of native dune species sufficient to stabilize the artificial dunes. Three major planting efforts were attempted: seeds were sown, vegetative propagules planted, and culms of native grass planted. This report contains information on seed treatments prior to planting and handling propagules and culms.

Newton, G. 1986a. Phase Two Seed Collection: Methods and Cost Analysis. Buhne Point Shoreline Erosion Demonstration Project. Prepared for County of Humboldt, Department of Public Works, Natural Resources Division.

The Report documents the cost, man-hours, and procedures necessary for collecting, processing, and storing seeds from eight local native dune plants for a full scale revegetation project. The report provides detailed information on the methods involved in collecting and processing the propagules of these species. Costs are analyzed for each species. Pertinent notes on the biology and ecology of each species are included.

Newton, G. 1986b. Phase III Planting. Buhne Point Shoreline Erosion Demonstration Project. Prepared for County of Humboldt, Department of Public Works, Natural Resources Division.

This report documents the effects of fertilizer application rates. Phase III planting was designed to investigate three levels of fertilizer application, 400 pounds/acre, 200 pounds/acre, and 50 pounds/acre. Data on stored seed viability is reported.

Pickart, A. 1985. A review of California Coastal Dune Restoration/Revegetation Projects. County of Humboldt, Department of Public Works, Natural Resources Division.

A review of restoration projects, revegetation techniques, and important project parameters. Contact persons for each project are provided.

Pickart, A. 1986a. Phase I Vegetation Monitoring Report. Buhne Point Shoreline Erosion Demonstration Project. County of Humboldt, Department of Public Works, Natural Resources Division.

A detailed report clearly identifying experimental design to test revegetation methods. The report includes results of one growing season's monitoring of two study plots. It examines the effects of nine treatments on germination, survival, and first-year foliar cover of nine native dune species. Germination was highest under control situations; however, foliar cover was enhanced by compost, fertilizer and hydromulch/fertilizer treatments. Survival was not directly affected by treatment. This report's findings became the basis of the design of Phase Two planting.

Pickart, A. 1986b. Phase Two Monitoring Report (Draft). Buhne Point Shoreline Erosion Demonstration Project. Submitted to

County of Humboldt, Department of Public Works, Natural Resources Division.

This report documents the results of second year monitoring of the Phase One Planting. Statistical means are used to assess treatment impacts to species foliar cover. A one-way Analysis of Variance (ANOVA) of second year foliar cover values revealed significant differences in cover treatments of six of the nine species. Treatment trends were more pronounced than those of the first year--slow release fertilizer was more clearly distinguished from other treatments.

Pickart, A. 1986c. Qualitative Evaluation of Phase II Planting. Buhne Point Shoreline Erosion Demonstration Project. Submitted to County of Humboldt, Department of Public Works, Natural Resources Division.

This report contains qualitative observations regarding the outcome of Phase Two plantings.

Strange, Terry. 1985. Untitled. Unpublished report prepared for County of Humboldt, Department of Public Works, Natural Resources Division.

A brief report identifying insect fauna found at the dune restoration site found over a three season collection period which took place during Phase One of the vegetation efforts.

US Army Corps of Engineers. 1984. Buhne Point Demonstration Project: Environmental Elements. Prepared by the Los Angeles District.

This concept report identifies the environmental elements of the Buhne Point Demonstration Project. The original plans for monitoring the dune vegetation efforts and benthic community impacts are discussed.

# **APPENDIX K**

## **OPERATION & MAINTENANCE MANUAL**



BUHNE POINT SHORELINE  
EROSION DEMONSTRATION PROJECT

OPERATION AND MAINTENANCE MANUAL  
DACW09-87-D0027, D.O.#3

Prepared for  
San Francisco and Los Angeles Districts  
Corps of Engineers

Prepared by  
Moffatt & Nichol, Engineers  
250 W. Wardlow Road  
Long Beach, CA 90807  
L-2434.03

August 1987

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## INTRODUCTION

### Purpose and Scope

This manual describes low-cost procedures for monitoring and inspecting the rubblemound and timber structures and the sandfill at Buhne Point. The intent of this manual is to present simple inspection techniques that can identify potential problems with the various project features. In addition, recommendations for operation and maintenance of the vegetation planting areas on the sand spit are presented. Detailed recommendations for long term vegetation management are presented as an appendix.

## INSPECTION PROCEDURES

Inspection of the rubblemound and timber structures and sandfill should be conducted twice a year. An inspection should be conducted at the end of the winter in May and at the end of summer in October. The inspections should take place at low tide to allow the greatest access to the structures. Two persons with a cloth tape, notebook and camera can conduct the inspection in two to three hours. A form is attached to be copied and used for note keeping and reporting problem areas (Figure 1).

### Structures

The groin and breakwater will be inspected for displaced cap stone, breaches or low spots indicating settlement. Large voids or discontinuities in the structure slopes or along the crest indicate areas of stone movement and will be noted. Areas where stones are displaced or have settled in relation to adjoining stones should be photographed with a known object (person or tape) for scale and the location and time of photograph recorded. Special attention should be given to inspect the backslope of the structures. This area is susceptible to damage when waves overtop the structures. This is especially important on the breakwater between stations 3+00 and 6+00. Areas where many stones (4 or more) have been displaced or show signs of settling should be reported immediately to the Corps of Engineers, Eureka Resident Office.

NOTE LOCATION OF:

- STONE DISPLACEMENTS
- SHOALS OUTSIDE STRUCTURES
- WATER LINE
- HIGH WATER LINE
- PHOTOGRAPHS TAKEN

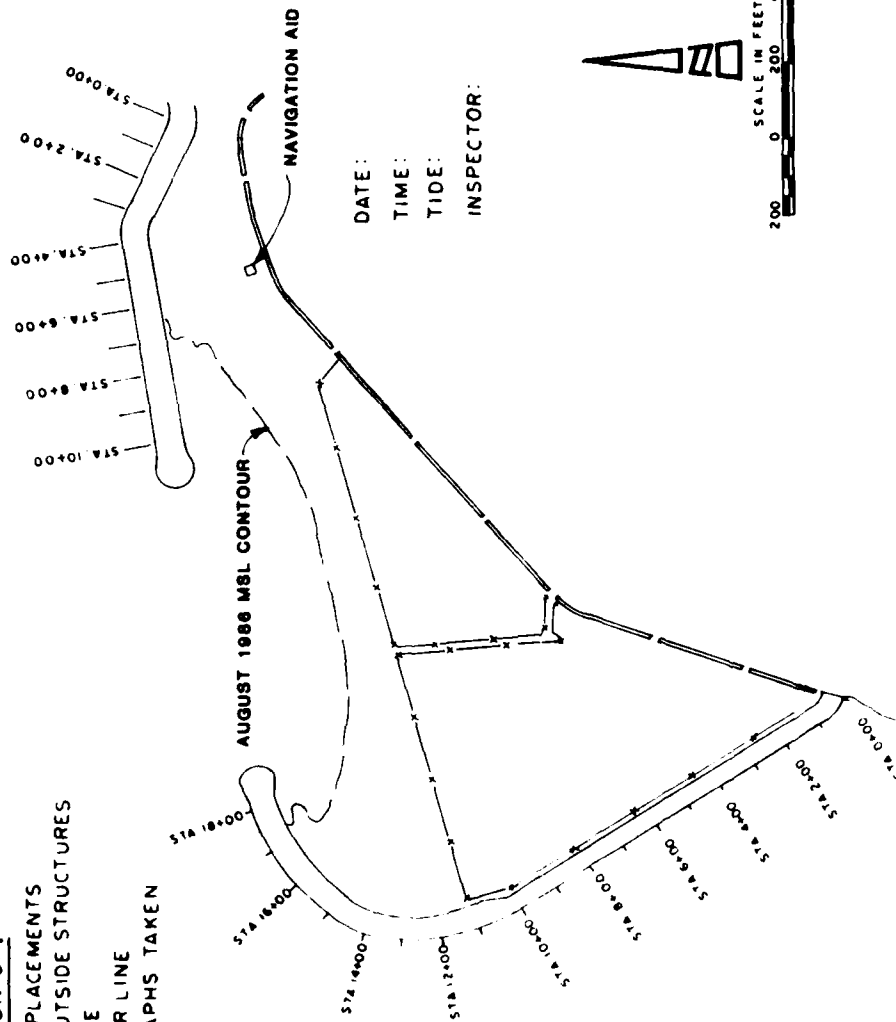


Figure 1. Inspection Sheet

The seaward side of the structures should be inspected for evidence of shoals or sand bars. These may be signs of sand migrating through the structure from the sandfill. Location and size of shoal should be estimated, photographed and noted.

The timber groin, although buried beneath the revetment and the sandfill, can still be indirectly inspected. Proper functioning of the groin will maintain the sandfill along the western edge of the project. The edge of the sandfill should be inspected for evidence of sink holes indicating movement of sand into the revetment. Any holes should be inspected to determine their location in relationship to the timber groin. The path of transport of the sand should also be determined as best as possible. Sand may be migrating through a break in the groin or over the top of the groin since the sandfill and revetment are higher than the crest of the groin in many locations. Large sink holes should be noted as they may present a safety hazard.

#### Sandfill

Monitoring of the sandfill will include measuring and drawing the shoreline position in relation to the existing fences and structures. The waterline at each structure and along the beach face should be sketched in, along with the high water mark. Any scarps or areas of active erosion should be noted on the inspection sheet. Major movements of the shoreline in relation to previous inspections should be brought to the attention of the Corps of Engineers.

## VEGETATION MANAGEMENT

Recommendations for managing the vegetation areas on Buhne Spit were prepared in June 1986 by Andrea Pickart under contract to the San Francisco Corps of Engineers. That report is contained in its entirety in the appendix. The recommendations are summarized herein.

### Public Access

Native dune vegetation has been shown to be extremely susceptible to trampling. The Buhne Point planting to date has been fenced to prevent trampling. Access to the beach area is provided by a corridor between the planting areas as well as on the east and west ends of the sandfill. Areas 1 and 2 shown in Figure 2, should remain fenced to protect the land cover and prevent destabilization of the dunes. These areas should be posted with interpretive signs which explain the project. Access into areas 1 and 2 should be restricted to research use, interpretive walks or educational use, or native propagule collection (when plant cover is sufficiently stabilized). Turf area 3 (red fescue) was designed for heavy foot traffic similar to the use of the area on the former spit. The fencing can be removed from area 3 when the growth of the fescue is adequate to sustain foot traffic.

### Maintenance of Red Fescue (Turf) Area (Area 3)

The red fescue (Festuca rubra) will become dormant in the summer and turn brown. The turf does not need irrigation in the summer and will turn green again after the onset of winter rains. Visual inspection of the turf area should be made annually to determine whether trampling causes bare areas. If so, reseeding should be accomplished with Festuca rubra only.

### Maintenance of Native Seed Mix Areas (Figure 3, Areas A1, 2; B; C1, 2; D)

Native seed mix areas should be weeded to remove grasses introduced by the hydromulcher. Areas C2 and parts of areas C1 and B should be weeded twice annually (December and May) for the first two years and annually (May) thereafter until weeds have been sufficiently reduced and the natives sufficiently developed to prevent detrimental competition. Areas which are

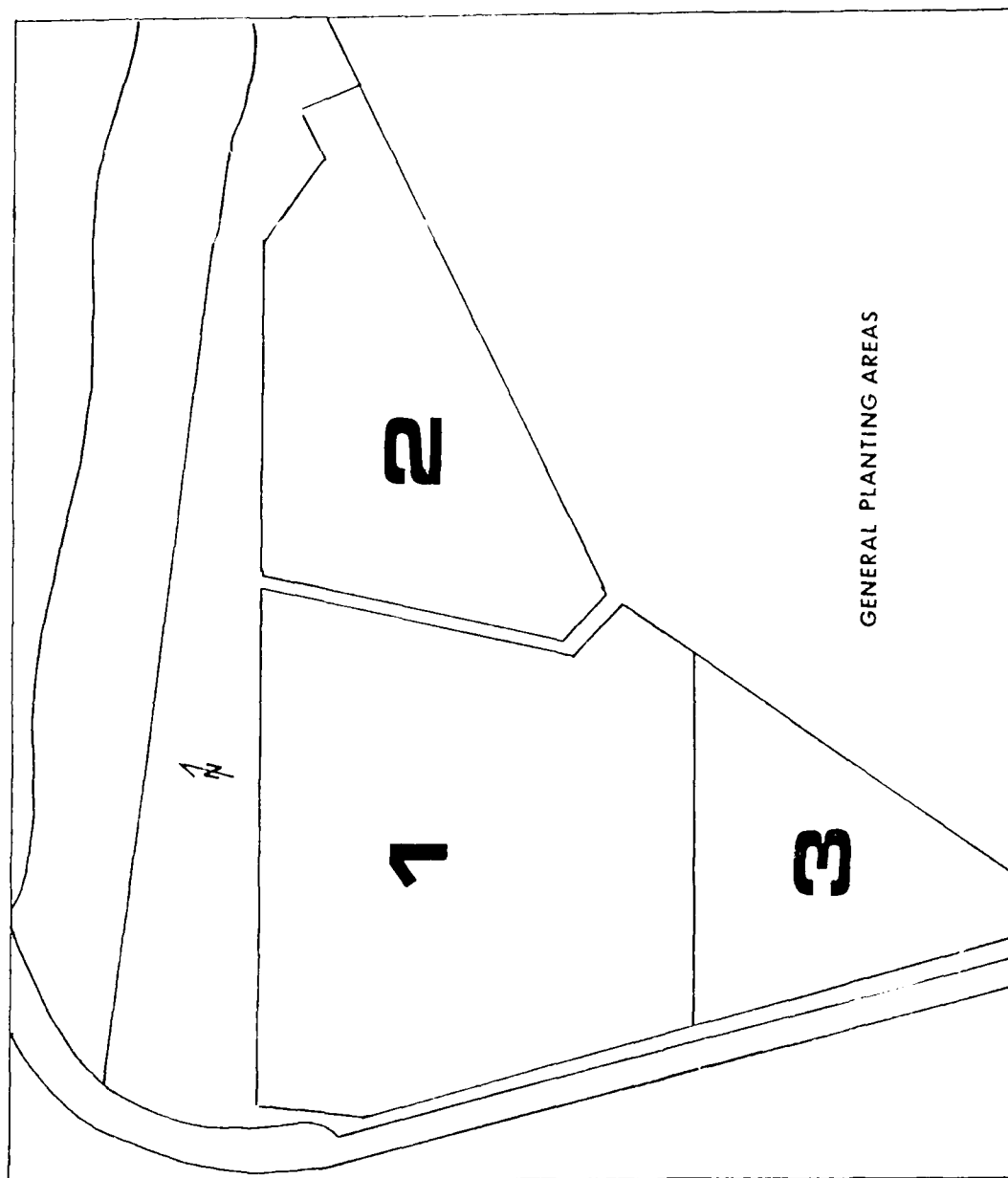


Figure 2. General Planting Areas.

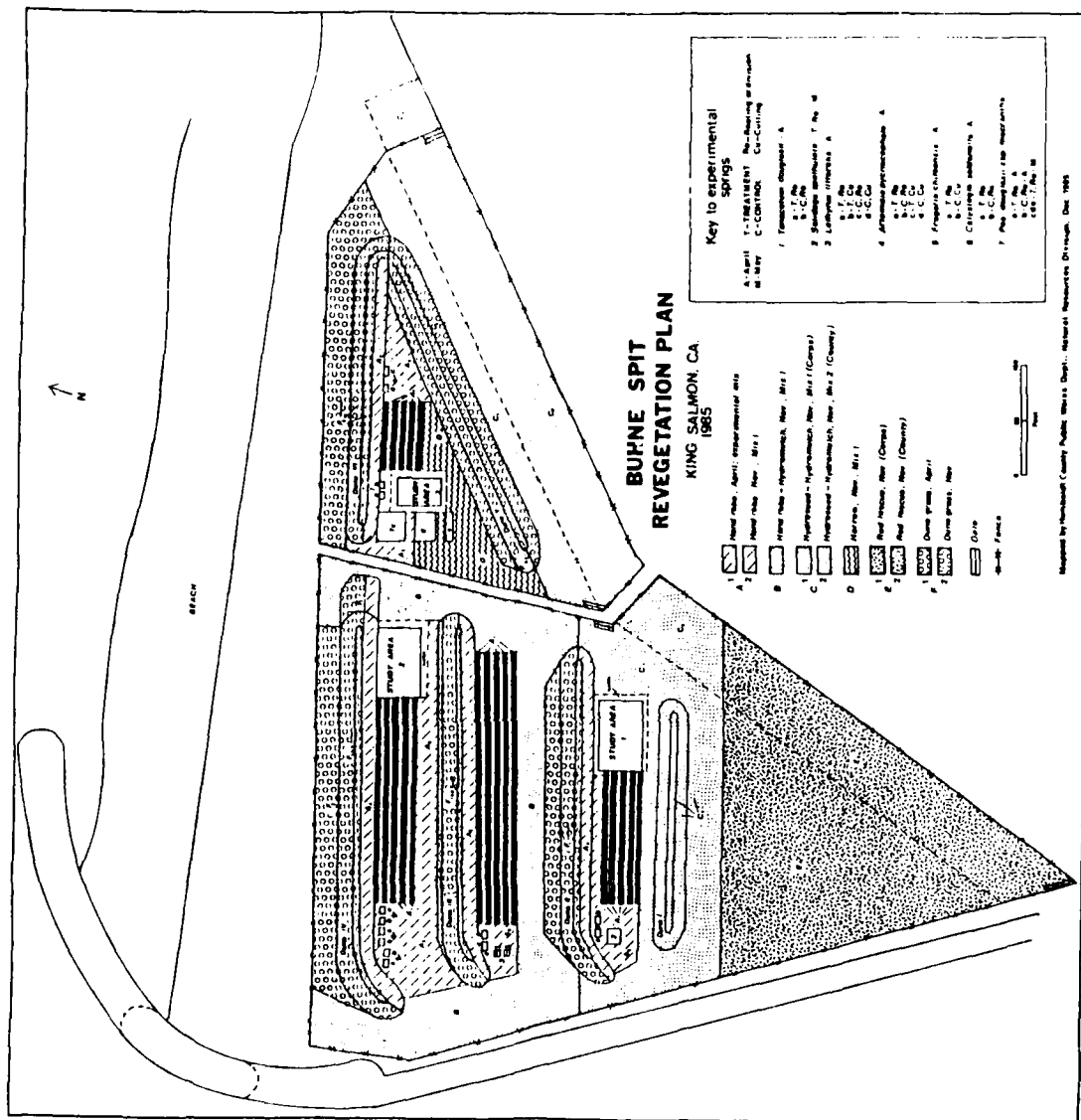


Figure 3. Location Of Specific Planting Areas.



not being managed for weed combat should be fertilized in Fall 1987 (after winter rains begin) with 100 pounds per acre of Osmocote slow release fertilizer 14:14:14.

Maintenance of Dune Grass Areas (Figure 3; F1, 2)

The dune grass areas should be surveyed annually by a qualified botanist during flowering season (late spring to early summer) to determine the extent of non-native American beach grass (Ammophila breviligulata). This beach grass is aggressive and is highly undesirable. It is imperative that this species does not become established and any plants found should be sprayed with a backpack sprayer using Roundup at 2% solution with a surfactant. Weed management for species other than American beach grass should be carried out as specified for the native mix areas.

The dune grass areas should be fertilized at the same time and at the same rate as the native mix areas. If remedial planting is performed, culms can be harvested on site from concentrated areas and planted according to the Phase Two Planting Report (Final Project Report, Appendix C).

Appendix  
MANAGEMENT RECOMMENDATIONS

MANAGEMENT RECOMMENDATIONS  
BUINE POINT SHORELINE  
EROSION CONTROL DEMONSTRATION PROJECT

Prepared by:  
Andrea Pickart  
June 1986  
Updated August 1987

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## INTRODUCTION

This document is intended as a guide to long-term vegetation management practices at the Buhne Point Shoreline Erosion Demonstration Project at King Salmon, California. A two-phased revegetation project undertaken by the Humboldt County Public Works Department under contract to the San Francisco District Corps of Engineers was completed in spring 1986 (Newton 1985a, Bio-flora 1986). A third phase of remedial plantings at the east end of the spit was undertaken in fall 1986 (Newton 1986a) but was eroded by high tides. As a result, snow fences were installed and additional plantings completed in spring 1987. While the plantings are now complete, additional management and maintenance will be required to ensure long-term success of the project. Management needs will be initially high relative to long-term requirements. This document summarizes appropriate management practices over time. It is a revised edition of a report prepared in June 1986, and incorporates important information which was unavailable at that time. For more detailed information on the revegetation project and its development, the following documents are available from Humboldt County Public Works Department or the Corps of Engineers:

- Phase One Seed Collection: Methods and Cost Analysis (Newton 1985b)
- Phase One Planting: Methods and Cost Analysis (Newton 1985a)
- Phase One Monitoring Report (Pickart 1986a)
- Phase Two Seed Collection: Methods and Cost Analysis (Newton 1986b)
- Phase Two Planting (Bio-flora 1986)
- Phase Two Monitoring Report (Pickart 1986b)
- Soil Nutrient Analysis (Clark 1986)
- Qualitative Evaluation of Phase Two Planting (Pickart 1986c)
- Phase Three Planting (Newton 1986a)

## MANAGEMENT RECOMMENDATIONS

### 1. Description of Planting Areas

The Buhne Point revegetation area is currently fenced in its entirety, with a corridor provided for public access. The planting consists of several discrete areas, which can be generally divided into three regions. Two of these regions are planted with a locally collected native seed mix and dune grass (Elymus mollis) transplants. They occupy the areas labelled 1 and 2 in Figure 1, in the northern portion of the spit. The third area is planted in a commercial strain of red fescue (Festuca rubra), a species native to local dunes. Area 3 occupies the southern corner of the spit. The following recommendations will refer to these three areas generally, as well as to the specific planting areas delineated and labelled in Figure 2.

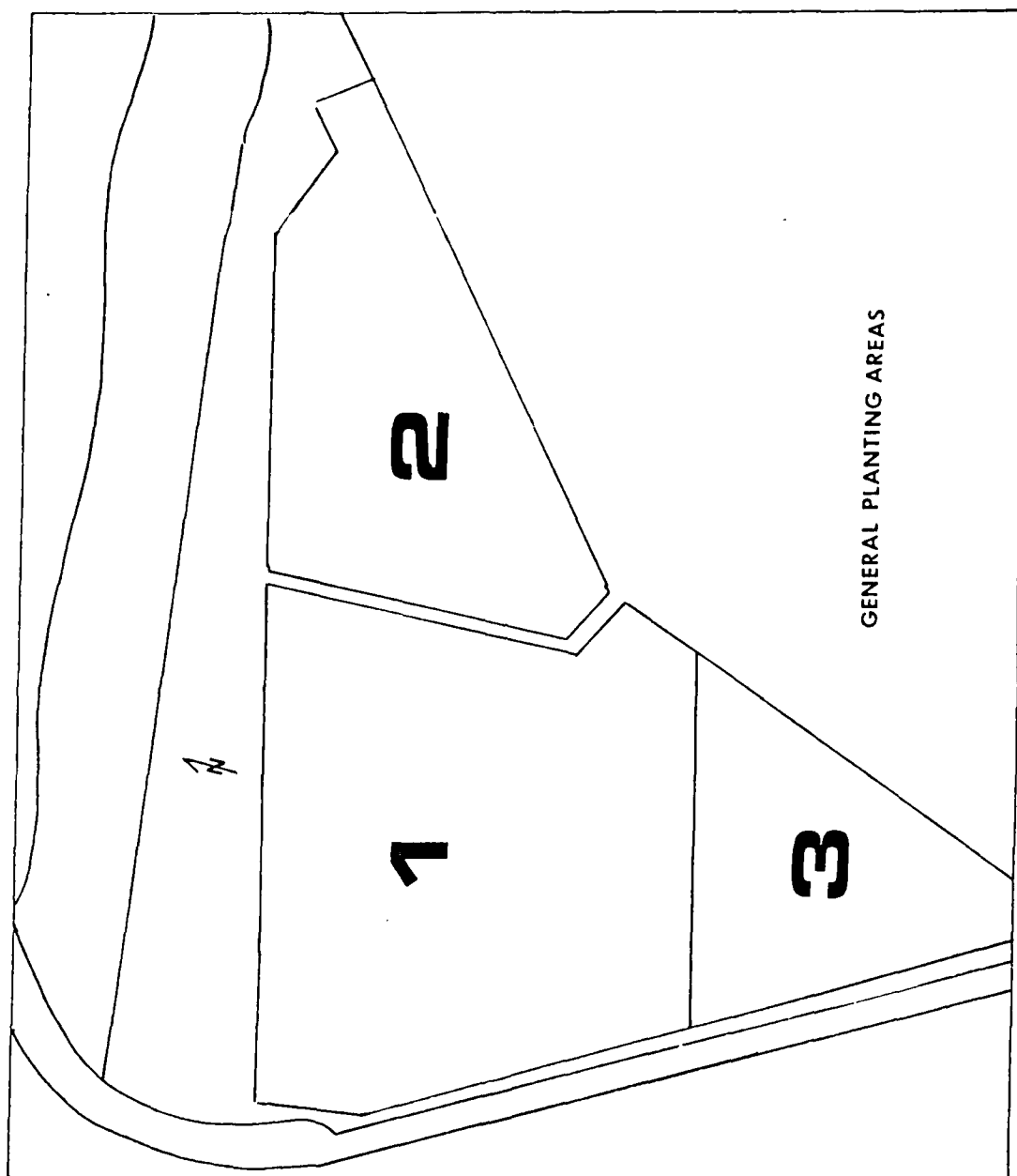


Figure 1: General Planting Areas

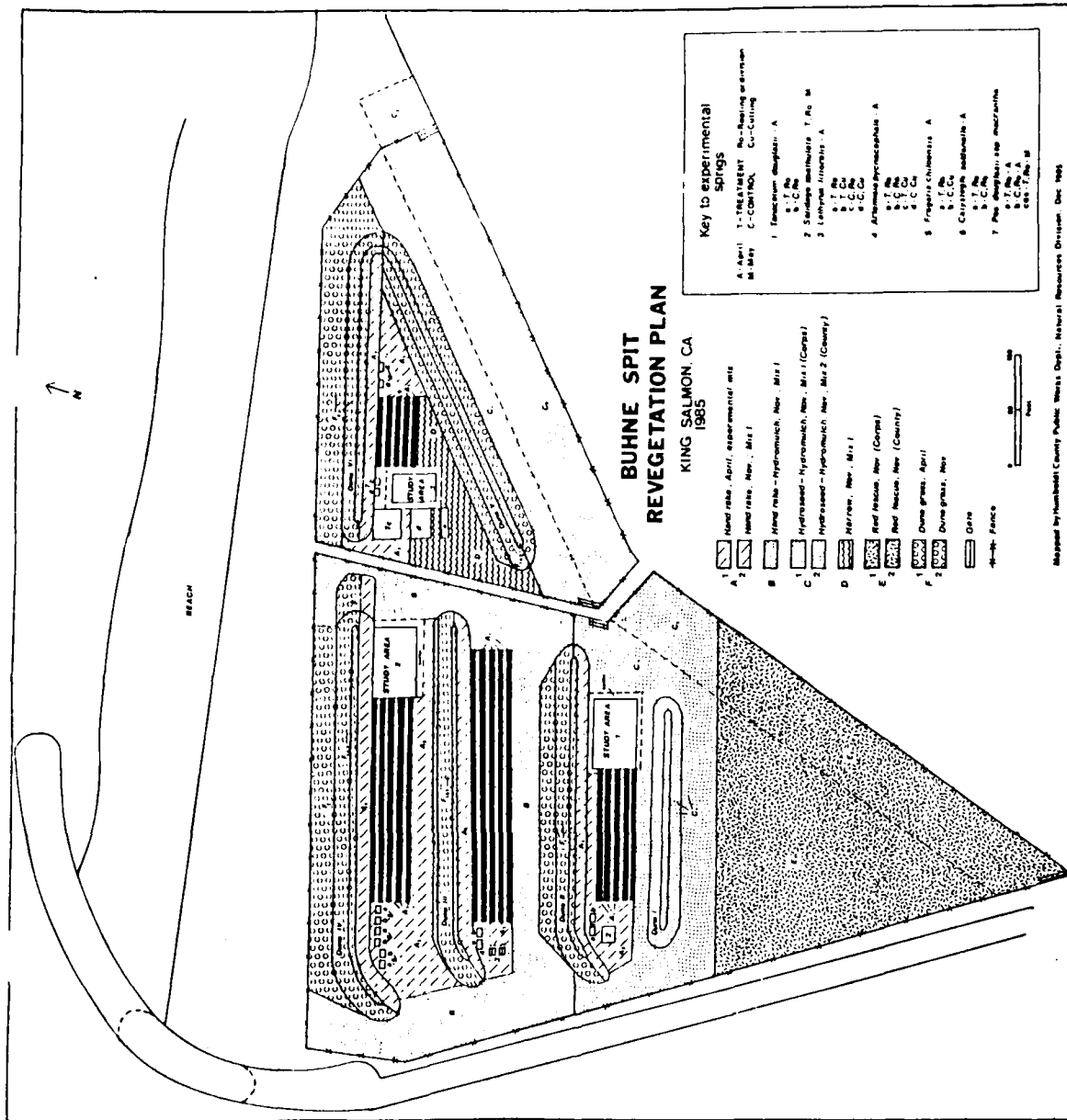


Figure 2: Location of Specific Planting Areas



## 2. Public Access Recommendations

Native dune vegetation has been shown to be extremely susceptible to trampling in a number of studies (Hylgaard and Liddle 1981, NPS 1986). A recently conducted human impact study at the Lanphere-Christensen Dunes Preserve in Arcata demonstrated that the local dune mat community (similar to the vegetation of the King Salmon project) may undergo significant loss of cover after as few as twelve passes (Brown 1987). The Buhne Point project had a dual purpose: to stabilize the sand spit and to create a native dune community. Both of these goals are served by the restriction of public foot traffic on the native planting areas.

All three planting regions have been fenced since 1985, with no complaints registered by local residents (Alderson, pers. comm.). Access to the beach area, which is unvegetated, is provided by a corridor down the center of the planting area as well as at the east and west ends. The red fescue or "turf" area (Area 3) was designed for heavy foot traffic, in order to provide an area for the type of uses prevalent on the former spit. The fescue area is well established and the fence can be removed, allowing public use.

Areas 2 and 3 should remain fenced in perpetuity. This will protect the plant cover and prevent destabilization of the dunes, as well as discouraging the establishment and spread of introduced species. An interpretive sign will be placed near the entrance of the project, and this will inform people of the purpose of the project and the reason for restricted access. Permitted uses within the fenced area should be as follows:

1. Research
2. Interpretive walks or educational use by qualified persons
3. Native propagule collection (as discussed below)

The revegetation project provides exceptional research opportunities. Although extensive pre-project experimentation was conducted (Pickart 1986a, 1986b), with some baseline monitoring (Clark 1986), no long-term monitoring was funded as a part of the project. It is imperative that long-term monitoring of vegetation be conducted to evaluate the true long-term success of the project in meeting the stated goal of community re-creation. Other areas of potential research include nutrient cycling, establishment of mycorrhizae, wildlife use and invertebrate populations. It is recommended that the local Universities be apprised of research opportunities and encouraged to undertake them.

Propagule collection (collection of seeds or vegetative parts of plants) should be permitted on the site as soon as cover is sufficiently established to avoid adverse impacts. Due to the underdeveloped nature of the majority of plants on the site (Pickart 1986c), it will probably be several years before material can be safely harvested. The opinion of a qualified botanist should be sought as to the advisability of collection before it is permitted. Reciprocal collection agreements were made with State Parks so preference should be given to this agency if they request collection rights. Seed collection should be performed with care to avoid trampling damage, and no more than 50% of the estimated seed production should be taken. Only perennial species should be collected. Vegetative propagules should be collected from no more than 20% of the plants of a given species and should be collected from mature, perennial plants only.

### 3. Maintenance of Red Fescue Area (Figure 1, Area 3; Figure 2, Area E)

This area was planted in a commercial strain of a native cool season turf grass, Festuca rubra, that becomes dormant in summer and does not require irrigation. Although the grass will turn brown in summer, it will continue to provide cover and will green up after the onset of winter rains.

The grass planting successfully stabilized Area 3, and no replanting is necessary. It is ready to be opened for public use. However, visual inspection should be made annually to determine whether bare areas develop. Any such areas should be reseeded with the same species. No other grass species should be used, as many are aggressive and may encroach on native dune areas. In opening this area up, the fence should be re-routed along the boundary between Areas 1 and 3.

Maintenance of Native Seed Mix Areas (Figure 2, Areas A1,2;B;C1,2;D)

The major management task for these areas will be weed control. Non-native grasses were accidentally introduced into the hydromulch mix and became dominant in area C2 and portions of areas C1 and B. Weeding of these areas was conducted by the CCC's in summer 1987. It will be necessary to continue weed management in these areas until natives become sufficiently well established and weed populations are sufficiently reduced such that natives are not outcompeted by weeds. It is anticipated that 3-5 years of decreasingly intensive weed management will be required. For the first two years, weed removal should occur twice annually in December or January to remove grasses and other weeds while they are still small, and again in late spring to remove any additional sprouts prior to fruiting. After the second year, removal can be performed annually. Weeds should be pulled or dug up, removing as much root material as possible. Once removed, grasses should be transported from the site. Weed removal in these areas is important because if unmanaged, weeds will displace natives. In addition to weed removal, it will be necessary to withhold any fertilizer or irrigation from these areas.

Areas A1,2 and portion of B and D were irrigated and fertilized (100 lbs per acre 16:20:0) in summer 1987. At the same time these areas were "thinned" to reduce the density of natives. This was needed because overapplication of seed led to dense germination and extreme competition between individuals causing suppressed growth. Fertilizer should be applied at the same rate but using Osmocote slow release in Fall 1987. Need for additional fertilizer in subsequent years (or need for additional thinning) should be evaluated on an annual basis by a qualified botanist.

#### 5. Dune Grass Areas (Figure 2, Areas Fl,2)

Dune grass was initially planted in Spring 85. It was discovered that a number of plants purchased were actually American beachgrass (Ammophila breviligulata). This species is native to the dunes of the east coast and has been introduced in Oregon, but is previously unrecorded at Humboldt Bay. It is an aggressive species that may outcompete the native dune grass Elymus mollis and its presence is highly undesirable. Eradication was undertaken in 1985 using a mixture of manual removal and Roundup. Roundup was very effective but resprouting occurred in the smaller areas where manual removal was used. These plants must be sprayed in summer 1988 during flowering, using 2% Roundup with a surfactant. In addition, an annual survey must be made by a qualified botanist to determine whether any plants remain. Figure 3 shows the inflorescences of American beachgrass and dune grass, which are similar in leaf morphology. It is imperative that this species does not become established on the site. Besides threatening the native community on the site there is a high risk of the species invading other dune areas on the bay.

Dune grass areas have shown a progressive loss of vigor since the first year planting, with the exception of those adjacent to the shoreline. This is explained by the species need for airborne nutrients deposited by salt spray and through sand burial. Dune grass was fertilized in Summer 1987 and will be refertilized in Fall 87. It is uncertain whether dune grass in the rear dunes will survive in the long-term, therefore it is important to monitor it so that the information generated will guide future planting efforts.

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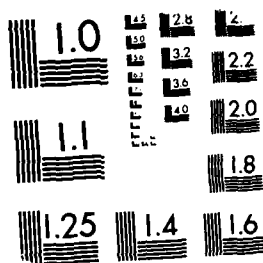
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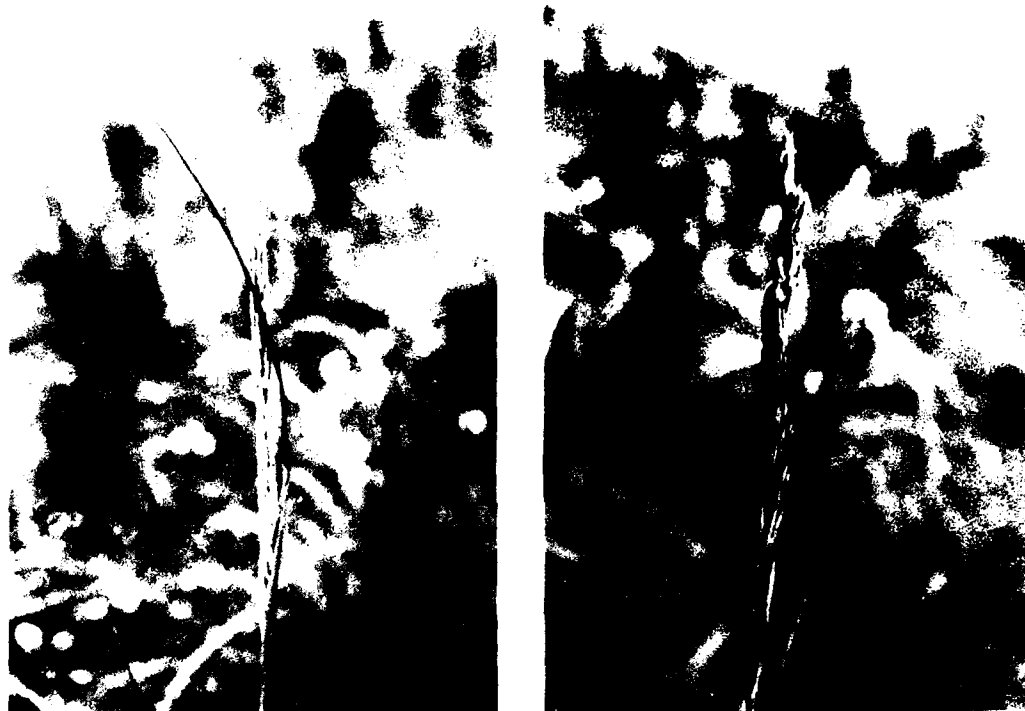


Figure 4: Inflorescence of American Beach Grass (left) and Native Dune Grass (right).

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- Newton, Gail. 1985a. Phase One Planting. Buhne Point Shoreline Erosion Demonstration Project. Humboldt County Public Works Department.
- Newton, Gail. 1985b. Phase One Seed Collection: Methods and Cost Analysis. Buhne Point Shoreline Erosion Demonstration Project. Humboldt County Public Works Department.
- Newton, Gail. 1986. Phase Three Planting. Buhne Point Shoreline Erosion Demonstration Project. Humboldt County Public Works Department.
- National Park Service. 1986. Visitor impacts on dunes at Indiana Dunes, Sleeping Bear Dunes and Pictured Rocks National Lakeshore. Department of the Interior.
- Pickart, Andrea. 1986a. Phase One Monitoring. Buhne Point Shoreline Erosion Control Demonstration Project. Humboldt County Public Works Department.
- Pickart, Andrea. 1986b. Phase Two Monitoring. Buhne Point Shoreline Erosion Demonstration Project. Humboldt County Public Works Department.
- Pickart, Andrea. 1986c. Qualitative Evaluation of Phase Two Planting. Buhne Point Shoreline Erosion Demonstration Project. Humboldt County Public Works Department.



# SCHEDULE OF MANAGEMENT ACTIVITIES

<u>Date</u>	<u>Activity</u>
Winter 87/88	Fertilize Areas A1,2;B;C1;F1,2(except areas where weeds removed) Move fence around turf area to boundary between areas 1 and 3 Weed removal, Areas C1,2;B
Spring 88	Weed removal, Areas C1,2;B
Summer 88	Survey for American beachgrass and spray
Fall 88	Evaluate need for thinning, fertilizing
Winter 88/89	Thin or fertilize as appropriate Weed removal, Areas C1,2;B
Ongoing	Weed removal, Areas C1,2;B Fence maintenance Reseed red fescue as necessary

## **APPENDIX L**

### **STEERING COMMITTEE MEETINGS**



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
**211 MAIN STREET**  
**SAN FRANCISCO, CALIFORNIA 94105**

April 25, 1983

Construction-Operations Div.

This is to confirm the Buhne Point Demonstration Project Steering Committee Meeting to be held at the Humboldt Bay Harbor Recreation and Conservation District Office on 3 May 1983 at 1:00 PM.

Preliminary plans, schedules and cost estimates for Phase I (H - pile with wood lagging groin parallel to Fields Landing Channel from the southwest end of Buhne Point Road near the intersection of Halibut Avenue and a smaller offshore structure north of the spit); Phase II (placement of dredged fill material in the area formed by the two structures;) and proposed model studies of the project area. Additional items to be discussed are the lands, easements and rights-of-way for project construction; maintenance agreement for the erosion phase of project; schedule and cost estimates for design/construction of Buhne Point Road; and coordination with Coastal Zone Commission and Regional Water Quality Control Board.

The following persons have been invited to attend this meeting:

Dave Eyres	Federal Highway Administration
Tom Smith	Federal Highway Administration
Jack Alderson	Humboldt Bay Harbor Recreation and Conservation District
Guy Kulstad	County of Humboldt
Don Tuttle	County of Humboldt
George Armstrong	California Department of Boating and Waterways
Ed Weeks	Pacific Gas and Electric Company
Mrs. Scott	King Salmon Area Residents
Don Spensor	Los Angeles District, Corps of Engineers
Jack Farless	San Francisco District, Corps of Engineers
Jack McKellar	Eureka Project Office, S.F. District, Corps of Engrs.

Sincerely,

Jay K. Soper  
Chief, Planning/Engineering Division

Copy furnished:  
Federal Highway Administration  
HNG-31  
400 7th St., S.W.  
Washington, D. C. 20590

THE ATTACHED LETTER SENT TO THE FOLLOWING ADDRESSEES

Mr. David Eyres  
Federal Highway Administration  
P. O. Box 1915  
Sacramento, California 95809

Mr. George Armstrong  
Department of Boating and Waterways  
1629 S. Street  
Sacramento, California 95814

Mr. Guy Kulstad  
Director of Public Works  
County of Humboldt  
Eureka, California 95501

Mr. Don Tuttle  
Department of Public Works  
County of Humboldt  
Eureka, California 95501

Mr. Jack Alderson  
Humboldt Bay Harbor  
Recreation and Conservation District  
P. O. Box 134  
Eureka, California 95501

Mr. Don Spensor  
Coastal Resources Branch  
U. S. Army Engineer District, Los Angeles  
300 N. Los Angeles Street  
Los Angeles, California 90012

Mr. Ed Weeks  
Pacific Gas & Electric Company  
1034 Sixth Street  
Eureka, California 95501

Mr. Tom Smith  
Federal Highway Administration

Mrs. Scott  
King Salmon Area Residents

UNITED STATES GOVERNMENT  
memorandum

DATE: 24 May 1983  
REPLY TO: Jack Farless, Program Manager, Buhne Point Shoreline Erosion  
ATTN OF: Demonstration Project  
SUBJECT: Minutes of Steering Committee Meeting #1

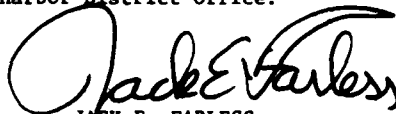
TO:

David Eyres  
Jay Soper  
Claude Wong  
Don Spencer  
Ed Weeks  
Tom Smith

R.C. Slovensky  
Pete Pettersen  
Don McGregor  
John Murray  
George Armstrong

Ron Jespersen  
Jack Alderson  
Donald O. Tuttle  
Guy Kulstad  
Robert Davenport

1. Minutes of the 3 May 1983 Buhne Point Shoreline Erosion Steering Committee Meeting #1 are attached for your information and use.
2. I wish to thank the Humboldt Bay Harbor Recreation and Conservation District for use of the meeting facility and Ms. Sharon Pena for the fine job she did to record the minutes of the meeting.
3. The next Steering Committee Meeting will be held on 23 June 1983 at 1300 hours at the Humboldt Bay Harbor District Office.



JACK E. FARLESS  
Program Manager, Buhne Point  
Shoreline Erosion Demonstration Project

Enclosure  
As Stated

Minutes of Buhne Point Shoreline Erosion Steering Committee #1

MAY 20 1983

1. On 3 May 1983, at 1300 hours the Buhne Point Shoreline Erosion Steering Committee #1 was called to order by Chairman, Mr. David Eyres. Introductions were made and a sign-up sheet was passed around. Those in attendance were:

<u>NAME</u>	<u>AGENCY</u>
David Eyres	Federal Highways Administration, Sacramento
Jay Soper	Corps of Engineers, San Francisco
Jack Farless	Corps of Engineers, San Francisco
Claude Wong	Corps of Engineers, Los Angeles
Don Spencer	Corps of Engineers, Los Angeles
Ed Weeks	P.G. & E.
Tom Smith	Federal Highways Administration, San Francisco
R.C. Slovensky	Federal Highways Administration, Sacramento
Pete Pettersen	Cal Trans
Don McGregor	Cal Trans
John Murray	Humboldt County
George Armstrong	California Department of Boating & Waterways
Ron Jespersen	California Department of Boating & Waterways
Jack Alderson	Humboldt Bay Harbor District
Donald O. Tuttle	Humboldt County Public Works
Guy Kulstad	Humboldt County Public Works
Robert Davenport	Humboldt Bay Harbor District

2. Discussion - Status of Agreement Between Corps of Engineers and Federal Highways Administration. The Department of Transportation acting thru the Federal Highways Administration as a result of the 22 March meeting requested the Corps of Engineers to submit a proposal for design and construction of the erosion phase of the demonstration project. A draft Memorandum of Understanding has been prepared by DOT and will be discussed on 4 May 1983 in San Francisco. When the M.O.U. is signed, a fund transfer will take place.

3. Proposed Design and Construction Schedule. A design and construction schedule was presented by Jack Farless outlining the proposed schedule for the four phases of construction of the Buhne Point Shoreline Erosion Demonstration Project. (See Inclosure 1).

a. Phase I - Construction of an approximately 1200 ft. long steel "H" pile and wood lagging groin extending from Halibut Street with a rubble mound head. Preliminary concept and design developed by California Department of Boating and Waterways. Humboldt County will be responsible for design and construction with construction funding by State of California. John Murray raised the question as to whether Federal funds would be contingent upon State funds which are in limbo at present. Jack Farless stated that the design concept by Cal Boating has been accepted by the Corps of Engineers and the Corps has agreed to provide foundation design analysis and profile alignment to the County for the groin. However, the County can not finalize design until there are funds in the budget sometime after July 1983.

b. Phase II - Corps of Engineers replacement of Buhne Spit with Dredged Material from Eastern edge of North Bay Channel. An estimated 600,000 cubic yards of coarse grain sand must be dredged from the middle ground area and pumped to replace the part of the spit that was lost. The Corps of Engineers can not go ahead with pumping sand until the Phase I groin is designed and construction started. Dredging is scheduled to start in October of 1983. It is critical to retain State funding for the Phase I Groin if there is to be any protection next winter. If Cal Boating funds do not materialize, it was suggested that \$500,000 be used to build the Phase I groin from the \$9 million dollars already budgeted, in which case the Corps of Engineers would have to do the design and work could not begin before the Spring of 1984. The Corps of Engineers' schedule hinges upon funding from State of California. In any case funding will not be available until July 1, 1983. Jack Alderson stated the representatives from the Harbor District will go to Sacramento May 9, 1983 to request funding and that he had reason to believe that Senator Boatwright would be in favor of it. He also stated that if all the capital from the Cal Boating fund were transferred to the State General Fund that it would delay funding for at least one year and would have to be rebudgeted. This has been before the Finance Committee once and was not killed. There will be another day in court on this matter Wednesday, May 11, 1983. The \$500,000 is not gone but there is no guarantee that it is available.

The construction schedule ties Phased I and II together. The Corps of Engineers permit must be obtained for Phase I and II. The County will be the sponsoring agency and must file for permits with the Corps and the Coastal Commission for the groin and beach fill. The permits will have to be signed before bids are opened on August 18, 1983. Don Tuttle stated that he can not apply with the Coastal Commission and the Corps of Engineers until the Corps gives them a technical description. An environmental assessment will be prepared by the Corps of Engineers as part of the permit process. Before advertising can take place the Harbor District will have to obtain easements and right-of-way by July 1983. Mr. Alderson stated that the property has been appraised so that the Harbor District can file Eminent Domain if necessary but that it may be resolved without Eminent Domain proceedings. It was also mentioned that the County would be responsible for the maintenance of the roadway while the Harbor District would be responsible for the maintenance of the shoreline structures. A suggestion was made that a resolution be obtained from the Board of Commissioners of the Harbor District denoting their approval of the construction design. Jack Alderson indicated that he would see to that.

c. Phase III - Corps of Engineers Model Studies; Corps of Engineers Construction of Final Containment Structures. Don Spencer of the Los Angeles District, Corps of Engineers, discussed the design concept for Phase I and II. Tide and wave patterns were discussed as tidal action is important in design considerations. Structural stability is dependent on wave action and sand deposits are based on waves and tidal currents. Two potentials for sediment movement were discussed; tidal current (2.5' per sec.) and wave induced (2.5' per sec. + 3.5' per sec.). Model studies will be required for proper design and construction of Phase II structures.

A 1:100 scale model for central area of Humboldt Bay, will be constructed to define currents and wave patterns for the project area. This model should be made to address the waves coming into Humboldt Bay Entrance and approaching Buhne Point.

A 1:50 scale model of the Buhne Point area will be constructed to study effects of breaking waves, sediment transport and rip currents. This model will not have the scale effects for breaking wave conditions that would exist in the 1:100 scale model. A steady maximum flood and/or ebb tidal current will be induced into the model. The tidal current values would be obtained from a numerical model.

A numerical model will be used to determine tidal currents around Buhne Point, and to calibrate model against prototype data. Data will be developed from this model to use for the 1:50 scale model. This model will also be useful to provide qualitative information on impacts by the proposed Buhne Point structures on adjacent areas in the Bay.

The model studies will tell what kind of retaining structure will be required, if any, and the impact on adjacent areas and the environmental considerations that will be needed. Three to four alternate plans will be considered with 9 runs for each alternate. Claude Wong suggested a tidal study monitoring study to supplement the model studies over a period of time. He also stated that it may be necessary to go 80' below the surface to check out the foundation for the Phase I Groin Structural design. The cost of the model studies has been estimated at \$350,000. A target date of June 10, 1983 was given for the model study approval by the Corps of Engineers' Washington Headquarters. It was also mentioned that the Corps would need coordinates for the center of Halibut Street, and Humboldt County Public Works would assist in getting them.

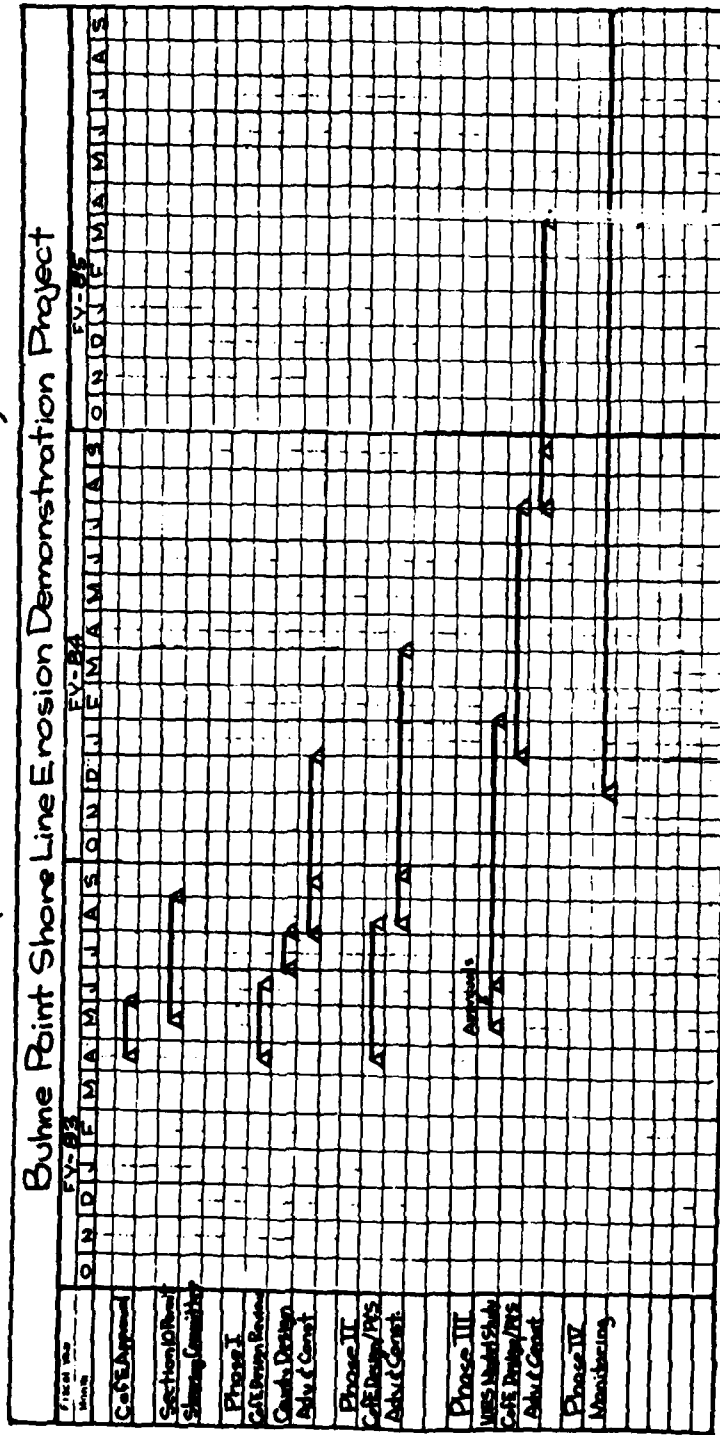
d. Phase IV - Monitoring. A discussion was held as to dealing with the environmental groups. The drafting of a preliminary monitoring study was suggested as it will be necessary before Phase III can begin. The monitoring process should continue until at least one year after completion of the project, two years if funding is available. It was suggested that Humboldt State University might be the ones to do the monitoring. It will be necessary to have at a minimum, beach measurements, topographic surveys and hydrographic surveys of the Phase II fill. It was suggested that details of a monitoring program be discussed at the next meeting. A discussion was held on the present shoaling problems in entrance channel and tidal action in central bay. The Corps of Engineers, as part of Phase II, will develop the borrow area along eastern edge of the North Bay Channel in Middle Ground area. This borrow area will partially widen the eastern edge of channel to a depth of -35' MLLW, but only to degree required to obtain sufficient material for the engineered spit fill operations.

4. A discussion was held on road construction. John Murray estimated the cost at \$550,000 plus \$75,000 for an extra 2' of fill to raise the grade. He also stated that a field review was needed with the Federal Highways Administration. The road would consist of a 50' section of two 12' lanes going in opposite directions, two 8' shoulders and two 5' sidewalks. It will also be necessary to remove the existing rip rap and repositioned. P.G. & E. has agreed to put the utilities underground. The Federal Highways Administration is to deal with Cal Trans on the road construction. There was a discussion on the existing rock wall and the consensus was that it should remain in place.

5. The date for the next meeting of the Steering Committee was set for 1:00, pm June 23, 1983 in the Conference Room at the Woodley Island Marina, Eureka, California.



## Buhne Point Shore Line Erosion Demonstration Project



UNITED STATES GOVERNMENT  
**memorandum**

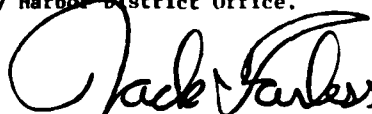
**DATE:** 15 July 1983  
**REPLY TO:** Jack Farless, Program Manager, Buhne Point Shoreline Erosion  
**ATTN OF:** Demonstration Project  
**SUBJECT:** Minutes of Steering Committee Meeting #2

**TO:** David Eyres  
Jay Soper  
Claude Wong  
Ervin Renner  
Don Spencer  
Ed Weeks  
Tom Smith  
Paul Berger  
Jim Huebner

Bruce Fodge  
Dan Ray  
John Murray  
George Armstrong  
Mrs. Betty Scott

Ron Jespersen  
Jack Alderson  
Donald O. Tuttle  
Guy Kulstad  
Robert Davenport  
Jack McKellar

1. Minutes of the 23 June 1983 Buhne Point Shoreline Erosion Steering Committee Meeting #2 are attached for your information and use.
2. The next Steering Committee Meeting will be held on 10 August 1983 at 1300 hours at the Humboldt Bay Harbor District Office.



JACK E. FARLESS  
Program Manager, Buhne Point  
Shoreline Erosion Demonstration Project

**Inclosure**  
**As Stated**

**BUHNE POINT STEERING COMMITTEE  
MEETING #2  
23 JUNE 1983**

**Present:**

David Eyres  
Jack Farless  
Richard K. Leatherman  
George R. Smith  
Bruce Fodge  
Dan Ray  
Doug Diemer  
Mrs. Betty Scott  
Jim Huebner  
Jay Soper  
Jack Alderson  
Ervin C. Renner  
Donald C. Tuttle  
Paul Berger  
Ed Weeks  
Claude Wong  
Ronald Jespersen  
Ted Ingersoll  
Jack McKellar

Federal Highways Administration  
San Francisco District Corps of Engineers  
Eureka Office Corps of Engineers  
Eureka Office Corps of Engineers  
California Coastal Commission  
California Coastal Commission  
Los Angeles District Corps of Engineers  
King Salmon  
South Pacific Division, Corps of Engineers  
San Francisco District, Corps of Engineers  
Humboldt Bay Harbor District  
Humboldt County Board of Supervisors  
Humboldt County Department of Public Works  
Los Angeles, Corps of Engineers  
P.G. & E., Humboldt Bay Power Plant  
Los Angeles Corps of Engineers  
California Dept. of Boating and Waterways  
Los Angeles Corps of Engineers  
Eureka Office Corps of Engineers

The meeting came to order at 1:00 p.m. in the Conference Room at the Woodley Island Marina with Mr. David Eyres presiding.

1. The minutes of the Steering Committee meeting #1 were approved.
2. Status of agreement between Corps of Engineers and Federal Highway Administration: It was indicated that the agreement has been signed and it is hoped that the funds are flowing along as planned. Copy of the agreement is attached. See incl #1.
3. Design and Construction Schedule Update.
  - a. Phase I - Steel pile and wood lagging groin
    - a.1. Status of State Funds - (Cal. Dept. - B&W): Mr. Jespersen reported that the construction would be funded with State funds and that the funds were in the budget. The budget should be to Governor Deukmejian by July 10th for his approval. The Department of Boating & Waterways has an agreement from Humboldt County and any funds expended by the County will be reimbursed. Humboldt County may be able to start the design before the funds are available. Design is scheduled to start July 1, 1983. Mr. Don Tuttle requested that the County have some sort of assurance of reimbursement before starting design. Contract award is scheduled for late August 1983.
    - a.2. Review of groin alignment (USACE - LA): Mr. Claude Wong reported that the alignment begins where the P.G. & E. sea wall ends at Halibut St. and extends in a northwest direction for 1000' paralleling the Fields Landing Channel. It is 350' north of the Fields Landing Channel with a curve at the end that follows the shape of Buhne Point. This curve will provide protection and absorb wave energy. A copy of the groin

alignment plan was provided. See Incl. #2. Mr. Wong proposed that the groin be moved 100' south to provide more room for sand. Mr. Ed Weeks indicated that he thought moving the groin would be advantageous, creating a better beach and a better wall. Moving the groin 100' to the south was concurred in by all concerned. USACE - SF will provide the center line bearing of the Fields Landing Channel to USACE - LA to tie the groin to channel to insure the groin will not encroach into the channel.

a.3. Review of F&M exploration program (USACE - LA): Mr. Ted Ingersoll reported that the soil studies showed the upper 30' consists of a mix of sand, clay and silt and that it would not be necessary to go down very far to drive piles. Mr. Ingersoll indicated that he went down 70' with the test and that there should be no settlement problem. The borrow site soil test showed coarse to fine sand and in one area clay below 24' MLLW. Further soil information should be forthcoming in about 2 weeks. The field work is done but the laboratory testing needs to be completed and the soil report written.

b. Phase II - Replacement of Buhne Spit with dredged material from Middle Ground area.

b.1. Review of fill design (USACE - LA): A discussion of the height of the groin wall was held. Mr. Jespersen stated that the new wall needs to be at least +12 which is +2 higher than the elevation of the sand. If caprock is to be added the wall should be +2 lower. It was agreed the Phase I steel pile and wood lagging groin constructed by the County would be constructed to +11' MLLW. The final Phase III groin height with rock riprap and cap stone added by the Corps of Engineers would be at a +14' MLLW elevation. The final sand elevation of the spit will be at a +12' MLLW elevation. Mr. McKellar stated that having rock on one side may cause a problem if the steel support gives away as the wind may cause erosion. A discussion followed as to different designs using rock on both sides or rock on one side and sand on the other. Mr. Farless pointed out that a change in design now would delay the project for this season. Mr. Tuttle indicated that the County was aware that the steel piles would rust and deteriorate with time, but thought that the sand would stay and that this was the reason for the model study. Mr. Weeks suggested staying with the Department of Boating & Waterways plan and correcting problems with maintenance. Mr. Tuttle asked if the new wall would interfere with the vista. Mr. Jespersen indicated that +12 MLLW is +3½ above mean sea level so that it should be no problem. A discussion was held on the need to raise the road. Mr. Tuttle indicated the existing Buhne Drive road is +6½ to +9' and they propose to raise it to +11' or +12'. Mrs. Scott stated that the residents of King Salmon are concerned that if the road is raised it will cause further flooding problems. Mr. Tuttle said that only the main road would be raised and that water would tend to run down the side roads. The raising of the road will not stop the present flooding but will help. Mr. Eyres indicated raising the present roadway must be reviewed in detail and is subject to approval by CalTrans and his agency.

b.2. Design - Plans and Specification Schedule (USACE - LA): Mr. Farless stated that Plans and Specifications for Phase II construction will be advertised on the 5th of August, 1983 and the bids would be opened on the 6th of September.

1983. The draft plans and specs will be ready in 2 weeks and copies will be sent out to the Federal Highway and the Harbor District for review. Mr. Ingersoll stated that the soil exploration map would be finished by 1 July 1983. The final plans and specs will be ready for review at the 10 August 1983 Steering Committee Meeting as well as the negative environmental declaration by the County. It was suggested that any final comments on the plans and specifications be telephoned to Jack Farless to avoid further delay of 6 September 1983 bid opening.

c.3. Cost Estimate (USACE - SF): Mr. Farless indicated that funds from FHAA are to be transferred but he doesn't know when. A discussion followed concerning P.G. & E. trucking 10,000 yards of fine sand to put behind the groin and be maintenance dredged from the Fishermen's Channel. Mr. Wong indicated that he would check into this plan to see if it would be feasible.

c. Phase III - Physical and Numerical Model Study Program.

c.1. Review of purpose and scope of test program (USACE - LA): Mr. Farless stated that approval has been received to do the testing and building of the models. There will be two models, 1:100 scale and a 1:50 scale. The model test program has not changed from the last discussion.

c.2. Schedule (USACE - SF): The physical models should be constructed and calibrated by mid September 1983 with testing of base and plan conditions by 31 December 1983. The Sediment Transport model testing phase will be complete by 28 February 1983.

c.3. Cost Estimate (USACE - SF): The total cost of the model test program will be approximately \$350,000. Mr. McKellar asked if the P.G. & E.'s project would change the configuration of the models. It was brought out that P.G. & E. is only doing maintenance and that would not change anything in the models. Mr. Farless stated that a meeting at Vicksburg is scheduled for 1 November 1983 to discuss progress and status of model testing program.

4. Status of Permit Actions.

a. Coastal Zone Permit - (Humboldt County): Mr. Tuttle indicated that an application was submitted to the California Coastal Commission and that it should go through in August, 1983 or September, 1983 at the latest. It was suggested that the negative declaration be cleared through the Menlo Park Fish & Game as it would be speedier.

b. Corps of Engineers Section 10-404 Permit (USACE - SF): A discussion was held on whether the proposed 100' southward movement of the groin would have an impact on the Corps permit. It was decided that it would not.

5. Status of land acquisition for spit construction.

It has been established that the H.B.H.R. & C.D. holds the deed.

6. Discussion of maintenance agreement requirements (USACE - SF): Mr. Farless told Mr. Alderson that the Corps would need a hold harmless, easements, rights of way and maintenance agreement. A draft agreement will be sent to H.B.H.R. & C.D. in the next several weeks by the Corps of Engineers, San Francisco District.

7. Open to discussion items: None

The next meeting will be held on August 10, 1983 in the Woodley Island Conference Room.

The meeting adjourned at 2:50 p.m.

**Project Agreement  
Between the Federal Highway Administration  
and the Corps of Engineers**

**Shoreline Erosion Demonstration Project**

**Humboldt Bay, California**

**Pursuant to Section 131(c) of the  
Surface Transportation Assistance Act of 1982**

**THIS AGREEMENT, entered into by the DEPARTMENT OF THE ARMY, SAN FRANCISCO DISTRICT CORPS OF ENGINEERS (CORPS) and by the DEPARTMENT OF TRANSPORTATION, acting through the FEDERAL HIGHWAY ADMINISTRATION (FHWA), WITNESSETH THAT:**

**WHEREAS, the Congress of the United States has authorized the appropriation of funds for a project to demonstrate state-of-the-art methods for repairing damage to highways and preventing damage to highways, resulting from shoreline erosion, and**

**WHEREAS, such project is to be carried out in the vicinity of Buhe Point, Humboldt Bay, California, and**

**WHEREAS, the Corps of Engineers is recognized as having technical expertise and facilities as needed to carry out design studies and to construct the shoreline protection project;**

**NOW THEREFORE, in consideration of the faithful performance of each party of the mutual covenants and agreements hereinafter set forth, it is mutually agreed as follows:**

**Article 1 - Project Description**

**Humboldt Bay is a natural harbor on the coast of northern California about 200 miles north of San Francisco. Within the bay area, about 3 miles south of the city of Eureka, and directly opposite the bay entrance, is a prominent bluff known as Buhe Point. To the southwest of Buhe Point is a small sand spit known as Buhe Spit (sometimes also referred to as Buhe Point). Directly east of the spit is the community of King Salmon. Buhe Drive, the only public access to King Salmon, runs along west side of King Salmon forming a bay side boundary between the shoal area and King Salmon.**

**Over the past decade, Buhe Spit shoal has eroded to the point where Buhe Drive is threatened. When strong northerly winds coincide with a high tide, waves break on to the roadway, disrupting traffic. To prevent Buhe Drive and underlying utilities from destruction, Humboldt County has reveted the bayside of the road**

with large rock. The revetment has protected the roadway during recent storms, but is not designed as a permanent structure to withstand large breaking waves. This project is for permanent stabilization of the eroding shoreline along Buhe Drive.

#### Article 2 - Responsibilities of the Corps of Engineers

The Corps of Engineers shall assume charge of the project and take all steps necessary to accomplish design and construction of a shoreline protection facility at Buhe Point, Humboldt Bay, California.

The principal items of work to be performed are:

- \*Prepare environmental documents.
- \*Carry out public involvement process and Coastal Zone Management requirements.
- \*Coordinate all project activities.
- \*Conduct design studies.
- \*Prepare Plans, Specifications and Estimate.
- \*Solicit bids.
- \*Award construction contracts.
- \*Administer construction contracts.
- \*Monitor construction.
- \*Monitor performance.
- \*Prepare final report.

#### Provisions

Eligible Work - Eligible work under this project is that which is necessary for the prevention and repair of damage to highways or access roads resulting from wave action in the vicinity of Buhe Point. Except as required for construction of erosion protection facilities, the reconstruction or repair of highways or access roads or relocation of utilities are excluded as work items under this agreement. This work will be performed by Humboldt County, under a separate agreement. Project work schedules shall be developed cooperatively with Humboldt County.



3

Environmental Studies - Environmental studies and documentation shall be in accordance with NEPA and all other applicable Federal and State requirements. The FHWA California Division shall be included as a cooperating agency in the environmental process.

Maintenance Agreement - In advance of construction, the Corps shall obtain a maintenance agreement with the appropriate responsible agency or agencies for maintenance of the completed shore protection facility over its design life in accordance with established Corps procedures. It is understood that the Corps, by obtaining this agreement, assumes no obligation for maintenance of the project.

Work Plan - The Corps shall prepare a comprehensive work plan for the project within 60 days from the date of this agreement. The work plan including future revisions thereof shall be approved by FHWA in writing and become a part of this agreement. The work plan shall include a description of the items of work to be performed, and a time schedule for accomplishing each item of work, as well as an estimate of the costs of design and construction.

Design Studies - Design studies shall focus on the following objectives.

1. Define an environmentally acceptable and cost-effective shoreline protection scheme which utilizes state-of-the-art methods.
2. Minimize adverse impacts outside the project limits.
3. Document the design and analysis procedures for demonstration purposes.

Design studies shall consider alternative shore protection measures. The detail of studies shall be sufficient to define the hydrodynamics of the existing system and to evaluate design alternatives.

The outcome of the design studies, including alternatives considered, shall be summarized in a design report.

FHWA Concurrence - The Corps of Engineers shall obtain written concurrence from FHWA in the following:

- \*Initial work plan and revisions
- \*Design studies to be performed
- \*Selection of protection scheme
- \*Final acceptance of the project
- \*Final report

4

**Performance Monitoring Period** - The performance monitoring period shall begin with completion of shore protection construction and shall continue over a 1 year period, plus time extensions approved in writing by FHMA. The FHMA final acceptance of the project shall take place at the completion of performance monitoring.

**Final Report** - The final report should include (1) a general overview of the project and a description of activities and studies which were accomplished and the outcome and (2) a detailed description of the engineering design study.

The final report shall be submitted to FHMA no later than 120 days after FHMA's final acceptance of the project. Part I should be presented in a non-technical form, augmented with a slide-tape or movie presentation as appropriate to accomplish the demonstration aspect of the project.

### **Article 3 - Funding and Financial Reporting**

The FHMA shall transfer obligational (contract) authority and obligational ceiling to the Corps via allocation letter from Director, Office of Fiscal Services, FHMA. The total amount of authority transferred shall be the estimated costs of design and construction as stated in the approved comprehensive work plan required by Article 2 of this agreement, not to exceed \$8.375 million. Upon execution of this agreement, obligational authority and obligational ceiling in the amount of \$500,000 will be transferred for preliminary investigations and coordination. The Corps will request cash on an as needed basis and such requests for cash will be directed to Chief, Finance Division.

The Corps shall submit a monthly SF-133, Report on Budget Execution, to the FHMA reflecting specific budgetary data. Because FHMA transfers other allocations to the Corps under the same treasury symbol ((96-20 X 8102) i.e., (a) Bridges over Dams and (b) Shoreline Erosion Demo), the SF-133 must be broken down to reflect each specific fund allocation and overall total. In addition, a IFS-2108, Year-End Closing Statement shall be submitted to FHMA.

### **Cost Overrun**

If the Corps, at any time, has reason to believe that the cost to the Government for performance of this agreement will exceed the estimated cost established in the work plan approved by FHMA, it shall promptly notify FHMA to that effect, giving the revised estimate of such total cost.

Should the total cost exceed the estimated cost (per work plan) for reasons beyond the control and without negligence of the parties to this agreement, FHMA shall bear the responsibility for seeking any additional funding that may be required. In no event shall commitments be made to exceed the total cost available at \$8.375 million without consent of FHMA and establishment of a source of funds for such overrun.

Project Steering Committee

The FHWA shall provide a chairman for a project steering committee made up of representatives from local governmental agencies and citizen groups. The purpose of the committee shall be to provide the views of local interests concerning the project. The views of the committee shall be considered advisory in nature with the Corps and FHWA having final decision authority. The Corps may be invited to attend meetings of the group and make presentations.

General

The agreement may be amended by the mutual concurrence of both parties and it will be in force and effect upon the date of signature by the appropriate parties.

U.S. Department of the Army  
Corps of Engineers

By:

Edward M. Leach.  
ETS, CC

Date:

6/13/83

U.S. Department of Transportation  
Federal Highway Administration

By:

M. Hernandez

Date:

6/15/83

Hand-drawn map of a coastal area, likely a bay or harbor. The map features several labeled locations and distances:

- Top Left:** "SOUTH POINT" and "DIST. 10.00 (10.00, 10.00)".
- Top Center:** "DIST. 10.00 (10.00, 10.00)".
- Top Right:** "DIST. 10.00 (10.00, 10.00)".
- Center:** "DIST. 10.00 (10.00, 10.00)".
- Bottom Left:** "DIST. 10.00 (10.00, 10.00)".
- Bottom Center:** "DIST. 10.00 (10.00, 10.00)".
- Bottom Right:** "DIST. 10.00 (10.00, 10.00)".

The map includes various lines representing roads, boundaries, or distances, and a small inset map in the bottom right corner.

[illegible]



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
**211 MAIN STREET**  
**SAN FRANCISCO, CALIFORNIA 94108**

September 15, 1983

Construction-Operations Division

This is to confirm the Buhne Point Demonstration Project Steering Committee Meeting #4, to be held at the Humboldt Bay Harbor Recreation and Conservation District Office on October 5, 1983, at 1:00 P.M.

Agenda for Buhne Point Steering Committee Meeting #4 and minutes of Steering Committee Meeting #3 are attached.

The following persons have been invited to attend this meeting:

Colonel Edward M. Lee, Jr.	San Francisco District, Corps of Engineers
Dave Eyres	Federal Highway Administration
Ervin Renner	Humboldt County Board of Supervisors
Tom Smith	Federal Highway Administration
Robert Davenport	Humboldt Bay Harbor Recreation and Conservation District
Jack Alderson	Humboldt Bay Harbor Recreation and Conservation District
Guy Kulstad	County of Humboldt
John Murray	County of Humboldt
Don Tuttle	County of Humboldt
George Armstrong	California Department of Boating and Waterways
Ed Weeks	Pacific Gas and Electric Company
Richard Rayburn	California Coastal Commission
Mrs. Scott	King Salmon Area Residents
Claude Wong	Los Angeles District, Corps of Engineers
Don Spencer	Los Angeles District, Corps of Engineers
Jack Farless	San Francisco District, Corps of Engineers
Jack McKellar	Eureka Project Office, San Francisco District, Corps of Engineers
Dick Leatherman	Eureka Project Office, San Francisco District, Corps of Engineers

Sincerely,

  
Jay K. Soper  
Chief, Planning/Engineering Division

Attachments (2)

A G E N D A

Buhne Point Steering Committee

Meeting # 4

October 5, 1983

1. Review of Steering Committee Minutes of Meeting # 3.
2. Construction Schedule Update.
  - a. Phase I - Steel pile and wood lagging groin.
    1. Status of construction (Humboldt County)
  - b. Phase II - Replacement of Buhne Spit with dredged material from Middle Ground area.
    1. Status of Construction (USACE - SF)
3. Physical and Numerical Model Study, Update (USACE - LA)
4. Proposed Monitoring Program (USACE - LA)
5. Review of Permit Actions
  - a. Coastal Zone Permit - (Humboldt County)
  - b. Corps of Engineers Section 10-404 Permit (USACE - SF)
6. Open to other discussion items.

BUHNE POINT STEERING COMMITTEE

Meeting # 3

August 10, 1983

PRESENT:

Dave Eyres	Federal Highway Administration - Sacramento
Jack Farless	Corps of Engineers - San Francisco
Leon Hamilton	County of Humboldt
Donald C. Tuttle	Department of Public Works
John Murray	Department of Public Works
Richard Oglesby	Department of Public Works
Ed Weeks	PG&E - Humboldt Bay Power Plant
Don McGregor	CalTrans - District 01
Pete Pettersen	CalTrans - District 01
Tom Smith	Federal Highway Administration - San Francisco
George Armstrong	Cal Boating
Ronald Jespersen	Cal Boating
Claude Wong	Corps of Engineers - Los Angeles
Richard K. Leatherman	Corps of Engineers - Eureka Project Office
Mrs. C. D. Perriguy	King Salmon Resident
Mrs. B. Scott	King Salmon Resident
Jack Alderson	Humboldt Bay Harbor District
Douglas M. Pirie	Corps of Engineers - San Francisco
Jack McKellar	Corps of Engineers - Eureka Project Office

The meeting was called to order at 1:00 p.m. in the Conference Room at Woodley Island Marina with Mr. Dave Eyres presiding.

1. The minutes of the last meeting were approved with the note: "0" MSL is approximately 3½' above MLLW.
2. Design and Construction Schedule Update.
  - a. Phase I - Steel pile and wood lagging groin
    1. Status of State Funds - (Cal. Dept. - B&W).

Mr. Armstrong stated that the Dept. of Boating and Waterways will have an agreement with the County before September 9, 1983, and that funding will be available and advertising will take place as scheduled on August 17, 1983.
    2. A status report was given by Mr. Hamilton and Mr. Murray. Plans and specifications were provided to some of the participants. It was indicated that advertising for bids would begin the week of August 15, 1983, and bids would be opened on September 9, 1983, if there were no changes. The bids will be opened late because the funding from the budget was late. Award will be made on Tuesday, September 13, 1983. Mr. Farless stated that the Corps of Engineers will not open bids until after the county bid opening in case there are any complications. It was decided that the Corps of Engineers will work with the County to coordinate the bid openings. A discussion followed in which it was suggested that, due to the tight budget, the toe protection will be called out as an alternate bid item. If the base bid with this alternate bid item is over the State/County budget, the Corps of Engineers will modify their contract to provide the rock toe protection, as it is necessary for the safety of the structure until Phase III is constructed.

The cast-in-place concrete beam to anchor the tie-back system was changed to pre-cast to speed up the on-site construction phasing. Mr. Murray indicated that it would be October 29th or 30th, 1983, before all material could be obtained by the contractor and actual construction could begin. Mr. McKellar stated that the dredge cannot work in the middle ground area any later than the first of November. Mr. Murray suggested having a liquidated damage clause in the contract. A discussion was held on moving the opening date up to September 6, 1983. It was decided that this would cause a conflict with the Labor Day Weekend. Mr. Alderson voiced a concern that to delay too long could cause some damage to King Salmon this winter. It was decided that with no problems 500 feet of wall could be built by mid-October, 1983, at a rate of approximately 100 feet per day. Mr. Murray stated that such a requirement could be put in the contract, but that it meant that the contractor would have to start ordering materials immediately to meet the deadline. It was decided that the stipulation to have 500' of wall in by October 14, 1983, would be put in the spec's along with a liquidated damage clause of approximately \$2,000 per day, since a delay would cost the Corps of Engineers to issue a stop work order on the Phase II beach fill contract. The question was raised as to whether the contractor could get his orders secured before Labor Day if he knew he was the low bidder. A lengthy discussion followed during which it was decided to change the County's bid opening to September 1, 1983, to aid the contractor in his ability to obtain materials. Mr. Farless said that he would provide the Corps of Engineers Marine Construction bidders list and Mr. Murray will phone bidders to expedite the process. Mr. Weeks stated that the PG&E sand would be available at any time as needed and trucked to the site by the lowest bidder. It was decided that PG&E should sell or give away the sand if they had the opportunity before construction began, since the contractor may choose not to use it as a platform.

- b. Phase II - Replacement of Buhne Point spit with dredged material from the Middle Ground Area.

b.1. Review of Final Plans and Specifications (USACE - LA)

Copies of the plans and specifications were distributed and discussed. The filter cloth bid item was discussed and will be removed as it was in the Phase I specifications. The specifications will be amended to require a contractor employee to be present at the fill site during all hours of fill placement operations. The Harbor District will be responsible for providing signs to keep the public out of the construction work area. The bid opening date of August 25 will be changed to September 8, 1983, with 120 days for construction.

3. Status of Permit Actions.

- a. Coastal Zone Permit - (Humboldt County).

Mr. Tuttle reported that the Negative Declaration has gone through the 30-day period and still needs to be adopted by the County Board. The Regional Water Quality Control Board in Santa Rosa recommends water sampling, but that a water certification is not required before work starts. An application for a Harbor District permit was filed on 8/10/83 and should encounter no problems. The Coastal Commission staff report is complete and should be on the agenda August 24th or 25th, 1983. Mr. Tuttle will try to attend that meeting.

- b. Corps of Engineers Section 10-404 Permit (USACE - SF). The period for comments has closed. There were no negative comments. The permit will be issued immediately after the issuance of the Coastal Commission permit. Mr. Tuttle was asked to supply a copy of the Negative Declaration, all correspondence and information to the Corps of Engineers for their files. The Corps of Engineers will furnish the



water quality sampling requirements in the Phase II contract to Mr. Tuttle, who will coordinate them with the Water Quality Control Board. The Corps of Engineers will notify the Water Quality Control Board before dredging operations begin. Mr. Armstrong stated that copies of all permits would have to be supplied to the Department of Boating and Waterways before any funds could be released.

4. Discussion of Maintenance Agreement ( USACE - SF/HBHR & CD).

The Corps of Engineers gave the Harbor District a draft Maintenance Agreement to be presented at the Harbor District Board meeting on August 11, 1983. Mr. Alderson indicated that the Harbor District will issue an administrative permit for repairing the beach. Mr. Alderson sent a copy of the deed and title insurance to the Coastal Commission. It was agreed that Section 221 of PL 91-611 be stricken from the agreement since the District was not entering into an agreement with the Secretary of the Army.

5. Open to other discussion items.

- a. A discussion was held on the field review for the road at King Salmon. The County is waiting for the field review to be signed. Mr. Murray brought out that the road will be of a constant and gentle grade, so that the water runoff problem will be kept to a minimum.
- b. Mr. Wong reported that the 1-50 and 1-100 scale models are designed and construction of both models has started. Tests are being run on the tidal circulation for the numerical study. Construction of both physical models will be complete by the end of September, 1983. Base line testing will start by mid-October, 1983.

A short discussion was held about the use of the King Salmon area. Mr. Alderson stated that the Harbor District will not build any buildings on the site. The area will remain open space. The date of the next meeting was set for October 5, 1983, to be held in the Conference Room at the Woodley Island Marina.

The meeting was adjourned at 3:30 p.m.



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
**211 MAIN STREET**  
**SAN FRANCISCO, CALIFORNIA 94105**

November 1, 1983

Construction/Operations Division

Dear

Minutes of the Buhne Point Steering Committee Meeting #4 are attached for your information.

A handwritten signature in cursive script, reading "Jack Farless".

Jack Farless  
Project Manager  
Buhne Point Shoreline  
Erosion Demo. Project

Attachment

# MINUTES

## Buhne Point Steering Committee

### Meeting #4

October 5, 1983

The meeting was called to order at 1:00 p.m. in the Conference Room at Woodley Island Marina with Jack Farless presiding. Mr. David Eyres was unable to attend the meeting.

#### PRESENT:

Jack Farless	U.S. Army Corps of Engineers, SF Dist.
Pete Pettersen	Dist. 01, CalTrans
Don McGregor	Dist. 01, CalTrans
Richard Oglesby	Humboldt County Public Works
John Murray	Humboldt County Public Works
Donald Tuttle	Humboldt County Public Works
George Armstrong	Dept. of Boating & Waterways
Jack Alderson	Humboldt Bay Harbor District
Ron Jespersen	Dept. of Boating & Waterways
Claude Wong	U.S. Army Corps of Engineers, LA Dist.
Timothy Kashuba	U.S. Army Corps of Engineers, LA Dist.
Ed Weeks	P.G.&E. Co., HBPP
Dan Ray	Coastal Commission
Richard Leatherman	U.S. Army Corps of Engineers, Eureka
R.E. Davenport	Humboldt Bay Harbor Commissioner
Guy C. Kulstad	Humboldt County Public Works
Mrs. W.T. Scott	Resident, King Salmon
Mrs. C.D. Perrigey	Resident, King Salmon

1. The minutes of Steering Committee Meeting #3 were reviewed and approved as submitted.

2. Construction Schedule Update.

a. Phase I - Steel pile and wood lagging groin.

1. Status of construction (Humboldt County)

A report was given by Mr. Richard Oglesby wherein he stated that 320' of pile are being driven per day. At present 600' of working pad is already in place and by 7 Oct 83 the end of this will be reached and it will be necessary to build another 600' of working pad which would take another week. The entire 1250' of bulkhead wall should be finished by the end of October. If all goes well, the rock groin should be complete by Nov 15, 1983. The question was raised as to storm damage to the structure if it is finished before November 1 since there would be no sand behind it until the dredge began operation. It

was suggested that there are several options open to accomplish any needed repairs including the issuance of an emergency permit or a change order to the existing contract. The Corps of Engineers and Humboldt County would need to work together. The construction schedule provides for a whaler to be placed that would afford some protection before sand fill is started by mid Nov 83. It may be necessary to stop construction before the last 4' of wall is completed to avoid damage. It was decided that it is necessary to keep an eye on the possibility of storm damage to the wall but that the problem could be handled if and when it occurs.

b. Phase II - Replacement of Buhne Spit with dredged material from Middle Ground area.

1. Status of Construction (USACE - SF)

Jack Farless reported that the contract award was made on the 14th of September and the contractor was given official notice to proceed on the 26th of September. The contractor had started to deliver submerged pipe to welding contractor in Eureka and will be ready when the dredge arrives on or about 14 Nov. The dredge goes in to the shipyard for paint and a Coast Guard inspection on the 1st of November and should be done by the 10th of November, adding two days for travel, it should arrive here by the 14th of November. The contractor was given a request for proposal on Oct. 14 for the Phase I Groin toe protection and the groin head in which the amount of toe protection was doubled. The first few days of dredging will provide quite a bit of protection for the wall. The signs should be in place where the County and State signs are by the first week in November.

3. Physical and Numerical Model Study, Update (USACE - LA)

Mr. Wong explained that there are two models involved - a 1-100 scale and a 1-50 scale. The 1-100 scale is now complete with model base test studies scheduled to start on 10 Oct 83. The testing will determine the existing wave conditions. The data gathered from the testing of the 1-100 scale model will be used for the 1-50 scale model. Base testing of the 1-50 scale model will take two weeks. There will be a meeting regarding the model studies on November 9, 1983 at 8:30 a.m. in Vicksburg, Miss. The physical model will be compared with the numerical model supplying much more accurate and valuable information that can be used in the future. The model is scheduled to stay in place until January 84 and a complete pictorial record will be kept making it possible to predict years of change. It was suggested that a representative from the County be present at the Nov. 9th meeting in Vicksburg as well as a representative from the Harbor District. Whoever wishes to attend this meeting should get in touch with Mr. Farless at least two weeks prior to the meeting.

4. Proposed Monitoring Program (USACE - LA)

Mr. Timothy Kashuba reported that the proposed monitoring program would consist of taking hydrographic and topographic surveys, combined with biological

surveys once a year. The surveys would start at the completion of Phase III and a base condition would be taken at that time. A discussion followed on the merits and cost of monitoring the borrow area. Mr. Wong indicated that he will look into the matter further and report back. A discussion followed on what kind of monitoring would be useful for the period of time between Phase II and Phase III. It was decided that an aerial survey taken one month after the completion of Phase II would be the best as it would give enough time to see how the sand will behave. Mr. Wong will have a draft monitoring program ready to present at the Nov. 9th meeting in Vicksburg.

5. Review of Permit Actions.

a. Coastal Zone Permit - (Humboldt County)

Mr. Don Tuttle reported that the Coastal Zone Permit is in hand and that all necessary permitting requirements have been met. It was brought up that a modification to the permit may be necessary when the exact configuration is known.

b. Corps of Engineers Section 10-404 Permit (USACE - SF)

Mr. Jack Farless reported that the Corps permit was issued Sept. 9, 1983 and that the Water Quality Control Board will be notified before any dredging starts.

6. Open to other discussion items.

A discussion was held on the parking situation along Buhne Drive. It was stated that there will be a 5' sidewalk and an 8' parallel parking lane on each side of the street with 2-12' wide road lanes. The utilities will be underground. It was suggested that if it is necessary to have aerial surveys of the area they could be combined with the aerial surveys that the Corps will be taking.

The next meeting of the Buhne Point Steering Committee in the Eureka area will be held on January 18, 1984 in the Conference Room in the Woodley Island Marina District Office.



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
**211 MAIN STREET**  
**SAN FRANCISCO, CALIFORNIA 94108**

March 14, 1984

Construction-Operations Division

Dear

Minutes of the Buhne Point Steering Committee Meeting #5 and Agenda  
for the March 21, 1984 Steering Committee meeting are attached.

Sincerely,

A handwritten signature in cursive script, reading "Jack Farless".

Jack Farless  
Project Manager  
Buhne Point Shoreline  
Erosion Demo. Project

Attachments

A G E N D A

Buhne Point Steering Committee

Meeting #6

March 21, 1984

1. Review of Steering Committee Minutes of Meeting #5.
2. Construction Schedule Update.
  - a. Phase II - Replacement of Buhne Spit with dredged material from Middle Ground area.
    1. Status of Construction (USACE - SF)
3. Physical Model Study. Update (USACE - LA)
4. Proposed Monitoring Program (USACE - LA)
5. Proposed Vegetation Plan of Replaced Spit Area (USACE-LA)
6. Open to other discussion items.

MINUTES

BUHNE POINT DEMONSTRATION PROJECT  
STEERING COMMITTEE MEETING #5

January 25, 1984

THOSE PRESENT:

David Eyres  
Jack McKeller  
Jack Farless  
Richard K. Leatherman  
Donald C. Tuttle  
Jack Alderson  
John Murray  
Richard Oglesby  
Guy C. Kulstad  
A. K. Tonkin  
Roger D. Brown  
Tom Smith  
Tim Kashuba  
David Miller  
Don Tidd  
Arne Arneson  
Travis Jenner  
Robert S. Chaffee  
Don McGregor  
Ferne Enke  
Capt. A. Olaf Skauge  
Dennis Pecaut  
Ron Kuensland  
James R. Morris  
O. J. Berghagen  
Mrs. W. T. Scott  
Mrs. C. D. Perriguy  
Mrs. Wayne Schmalz  
Ella Hardison  
Cindy Fonstein  
J. A. Gast  
R.E. Davenport  
H.D. Blumer  
R.B. Hardison  
Dan Ray

Federal Highways Administration  
Corps of Engineers, Eureka Office  
Corps of Engineers, San Francisco Dist.  
Corps of Engineers, Eureka Office  
Humboldt County Dept. Public Works  
Humboldt Bay Harbor District  
Humboldt County  
Humboldt County  
Humboldt County  
Tonkin Construction Co.  
Tonkin Construction Co.  
Federal Highways Admin., San Francisco  
Corps of Engineers, Los Angeles Dist.  
Congressman Douglas Bosco's Office  
Pacific Gas & Electric  
Pacific Bell  
Pacific Gas & Electric  
P.G. & E., Humboldt Bay Power Plant  
CalTrans, Dist. 01  
Retired  
King Salmon, CA  
King Salmon Charters  
Osberg Construction  
Osberg Construction  
King Salmon, CA  
King Salmon, CA  
King Salmon, CA  
King Salmon, CA  
Trinidad, CA  
Times Standard  
Hum. Bay Harbor Dist., Pres. of Board  
Humboldt Bay Harbor Dist., Commissioner  
Humboldt Bay Harbor Dist., Commissioner  
Humboldt Bay Harbor Dist., Commissioner  
California Coastal Commission

The meeting was called to order at 1:03 PM by the Chairman, David Eyres.



1. Review of Steering Committee Minutes of Meeting #4.

The minutes were approved as submitted.

2. Construction Schedule Update.

a. Phase I - Steel pile wood lagging groin.

(1) Status of construction (Humboldt County).

Mr. Jack Farless and Mr. Richard Oglesby gave a progress report and stated that the bulkhead wall is completed. Anchor rod footings, anchor rods and filter fabric is still needed but no further progress can be made until the Phase II contractor commences work.

Mr. Farless complimented the County and the contractor (Tonkin Const.) on the fine job that they have done.

b. Phase II - Replacement of Buhne Spit with dredged material from Middle Ground Area.

(1) Status of Construction (USACE - SF)

Mr. Jack Farless reported that the contract was awarded in September (to Osberg Construction) but the contractor was late in his mobilization due to the West Coast Shipyard strike and poor weather conditions.

Dredging began in mid November but the equipment was not able to perform so dredging was stopped. Mr. Farless indicated that an effort is being made to continue discussions with the contractor and that various alternatives are being considered to get the beach fill placed as soon as possible. A meeting between the Corps of Engineers and the contractor to discuss various options and alternatives will be held week of 30 Jan 84.

The contract ends on Feb. 19, 1984 but the contractor is entitled to an extension due to the adverse weather conditions and shipyard strike. The Corps contractor, Osberg Construction, is responsible for the rubble mound head. The Corps of Engineers will continue to provide any rock protection necessary for maintenance of the Phase I structure. As soon as a solution is worked out with the contractor, it will be made known.

3. Physical Model Study. Update (USACE - LA)

Mr. Farless explained that the Corps of Engineers, San Francisco Dist., has the overall project management and the Los Angeles Dist. is the design agent for Phase II, the foundation of Phase I, Phase II, Phase III and the monitoring program after construction.

The Corps Waterways Experiment Station is on schedule with the Buhne Pt. model study. James A. Gast, Jack Farless, Don Tuttle and Tim Kashuba will

be attending a meeting on January 30, 1984 in Vicksburg to see the results of the model study. If everything continues to go on schedule, the design and plans and specifications should be finished by July or August of 1984 and will be ready for advertising for the final Phase III by May of 1984.

Mr. Tim Kashuba distributed a handout on the results of the model study. A discussion was held on the contents of the handout and Mr. Kashuba explained the document in detail. Don Tuttle supplied some slides that were also presented in conjunction with the model study document.

Mr. Kashuba stated that to start, three basic concepts were developed to cope with the erosion problem: (1) a groin plan; (2) a jetty plan, one on the north end of the sandfill and an extension of the Phase I groin; and (3) an offshore plan. Since the groin plan would require too much rock and would therefore be very expensive, it has been abandoned. The jetty plan will stabilize the beach very well and allow for an 850' jetty at the north end and a 450' extension of the groin at the south end. The reflected waves will be disbursed by the configuration of the curve in this plan. The offshore breakwater plan has not been tested, but will be in the near future as there is some concern over wave and current action causing the movement of sand. The testing should indicate what will be effective in stopping erosion and the data will be used in making recommendations for the Phase III plan. See Incl #1 for a more detailed explanation of the model study program.

The movement of the jetty north will have a positive effect on wave action that might be threatening to the road. The elevation of the groin will be +13 MLLW. The question was asked of Mr. Kashuba if the effect of reflected waves on the Elk River Spit area was addressed in the model study. He indicated that it was not but that there should be no problem with reflected wave action in any area.

Mr. Jack Alderson indicated that the movement of the jetty to the north may tie it into private property in which case maintenance could cause some problems. One solution would be that P.G. & E. deed a small amount of property over. Mr. Tidd of P.G. & E. was asked to look into the possibilities. Another solution suggested was that P.G. & E. volunteer to do partial maintenance since public funds cannot be expended to protect private property. It was decided that the County, P.G. & E. and the Harbor District would have to meet and work out the best plan.

James A. Gast, President of the Harbor District, stated that he had two concerns: (1) that the jetty would not be far enough north to protect the road and the resulting hardship on the residents and facilities of King Salmon; and (2) the fact that the Harbor District has committed to maintenance for an indefinite period of time. It was brought out that there has been no change in the P.G. & E. rock since 1952. President Gast suggested that the north jetty be tied into the P.G. & E. rock. Mr. Alderson stated that a few years ago, P.G. & E. rebuilt the jetty with more rock and it has not yet met its angle of repose. Mr. Tidd asked that if P.G. & E. deeded a portion of property, would there still be access for maintenance? The answer was yes.

4. Open to other discussion items.

Mr. Jack McKeller presented some slides on the sediment problem in the Harbor entrance channel. He stated that contrary to popular belief, the sediment problem, in his opinion, is caused mainly by the Eel River. He also discussed the erosion along the Mad River.

Commissioner Robert Davenport asked when the proposed north jetty will be under construction. Mr. Farless stated that the aim is to finish the design plans and specifications by the end of July 1984 and then advertise and begin construction by August or September 1984. Mr. Murray indicated that with that time schedule, the road construction would begin in the Spring of 1985 as it would be necessary to have the contractor out of there before construction can begin. Mr. Ray stated that it probably would also be necessary to amend the Coastal permit.

Commissioner Hardison raised a question about slop wave action possibly increasing erosion on the north jetty. Mr. Kashuba explained that the built in curve would deflect the waves.

Jack Alderson stated that the County had asked that the right-of-way be moved over 10 feet. Mr. Alderson said that that would be fine.

Mr. Kulstad brought out that there were many residents of King Salmon at the meeting because of their concern whether Jack McKeller was authorized to keep the construction road parallel to Phase I groin together. Mr. Farless stated that there is a plan to maintain it and that it would be necessary in order to protect the groin. Mr. Kulstad said that a further concern of the King Salmon residents was that there may be a reluctance to spend money on maintenance of the road due to recent changes in the State law. Mr. Farless said that that particular point had not been discussed. Mr. Kulstad asked that it be looked into and brought before legislative representatives for action. Mr. Farless indicated that there are no emergency funds for maintenance but that if the Federal Highway Administration authorized the expenditure of some of the demonstration funds, it could be taken care of in that way.

A King Salmon resident expressed concern about one point along the jetty where the rock is only 3 feet higher than the road. Since it has been a mild winter, there has been no problem, but there could be trouble in the event of storm. Mr. McKeller stated that during the current construction phase, this could present a problem but that when the project is finished, the problem should be solved. It was suggested that some of the existing funds be set aside now for an emergency. It was decided that this possibility would be researched.

A question was raised about the cost of the north jetty project. Mr. Kashuba said that it would run about 1.4 million dollars.

A King Salmon resident asked if the underground utilities would be along Buhne Drive only. The answer was yes.

The next meeting of the Buhne Point Steering Committee will be held on March 21, 1984 at 1:00 PM in the Conference Room of the Woodley Island Marina.

The meeting was adjourned at 2:31 PM.

#### BUHNE PT MODEL STUDY PROGRAM

The purpose of the model studies was to develop alignments and crest elevations for Phase III structures to stabilize the Phase II sandfill.

The general methodology of the model program, shown on page 1 of handout, was to transform waves in from deep water to the entrance to Humboldt Bay using a refraction analysis. The next step was to transform the waves through the entrance channel into central Humboldt Bay using a 1:100 scale (undistorted) model. Wave heights and forms from the 1:100 scale model were used as input to a 1:50 scale (undistorted) model where coal tracer material was used to simulate sandfill and spit conditions. The 1:50 scale model ultimately was used to test various alignments of structures designed to stabilize the fill. A numerical tidal model augmented the physical model by providing boundary tidal and water elevation data to be used during physical testing.

The deep water statistics used are shown on pages 2 thru 5 (National Marine Consultants, 1960 and Department of Navigation and Ocean Development, 1977).

The refraction analysis transformed the waves from deep to shallow water by computing refraction and shoaling coefficients. These coefficients are then multiplied together to yield a wave adjustment factor that is multiplied to the deep water wave height to obtain the shallow water wave height. Refraction diagrams are shown on pages 5 thru 9. These diagrams show wave direction and relative energy as deep water waves approach shallow water. When the lines of equal energy (orthogonals) converge, energy is concentrated and wave heights increase; when the lines diverge, the energy is dispersed and wave heights decrease.

The 1:100 scale model, shown on page 10, used the wave characteristics from the refraction analysis and the tide conditions from the tidal model as input to a wave generator located just outside of the entrance channel to Humboldt Bay. Tests were run using this data and the resulting wave forms inside the channel, in Central Humboldt Bay and impinging on Buhne Point/King Salmon were observed (pages 11 - 15).

These observations enabled the Corps to:

- (1) develop initial alignments for Phase III structures and confirm the initial alignment of the Phase II sandfill
- (2) develop an alignment for the wave generator for the 1:50 scale model. This was based on the coincident wave forms just inside Humboldt Bay near the entrance channel. (pages 17 and 18)
- (3) confirm general wave forms with prototype observations (slides and page 16)

Testing was then initiated on the 1:50 scale model. (page 19) The first tests were conducted to determine the wave and tidal current conditions at each still water level that produced the largest current velocities, and therefore the largest potential for sediment transport, along Buhne Point and King Salmon. The input data for these tests came from the results of the 1:100 scale model and the numerical tide model. Once the maximum current conditions were established, testing began using coal tracer material to qualitatively represent sand movement. Scaling effects require that material used to represent prototype sand have a reduced groin size and specific gravity in the model, therefore, coal was used.

Coal tracer tests began with two historical configurations of Buhne Spit; 1966 and 1980 (pages 20 thru 28). The tests indicated that erosion of the Spit began at the upcoast end, migrating the material along the spit and eventually, depositing the material in Fields Landing Channel.

It was evident that severe erosion at the north end of the spit was caused by the particularly high wave energy impinging on the area. The downcoast end of King Salmon received a smaller amount of wave energy.

The next test conducted was the Phase I groin and Phase II sandfill configuration. The test showed a similar pattern of erosion as in the historical tests. Erosion was quick upcoast at Buhne Point, material migrated down the fill to the groin and eventually built up around the groin into Fields Landing Channel. (pages 29 thru 33)

The next testing included three concepts for Phase III rubblemound structures to stabilize the sandfill. The three concepts are:

- (1) a series of groins along King Salmon - pg. 38
- (2) a shore connected breakwater at Buhne Point and extension of the Phase I groin - pg. 39
- (3) an offshore breakwater at Buhne Point and extension of the Phase I groin - pg. 40
- (4) a combination of the above - pg. 41

The basic criteria for designing the conceptual plans was to keep the total length of structures less than that of the length of a revetment along the face of the sandfill.

The groin system was tested, pages 34 thru 36, and experienced the same erosion patterns as the historical and Phase I and II tests. Erosion in the "cells" upcoast was severe as the material moved out and around the groins. The furthest downcoast "cell" was relatively stable with eventual movement offcoast and around the groin into Fields Landing Channel. It was then apparent that longer and/or more groins would be

required to stabilize the fill under this concept. This would require an excess amount of structure and therefore cost. It seemed a plan, such as the Jetty plan, that more efficiently reduced the wave energy at Buhne Point was required. Therefore the groin plan was abandoned.

The jetty plan was then tested and was found to stabilize the sandfill at an acceptable level. The plan was optimized by reducing the structures lengths to the shortest length that still stabilized the fill. The resulting plan consisted of 450' extension (at +7' MLLW) of the Phase I groin and a 750' jetty at Buhne Point. The jetty has a reverse curve trunk to disperse reflected waves that may effect other structures in the bay and to disipate wave build-up along the trunk from a possible mulch stem effect.

The offshore breakwater concept will be tested shortly. It is anticipated that the breakwater will not perform as well as the jetty plan because of the diffraction of wave energy around the ends of the breakwater and the possibility of sand transport due to current moving out from the lee of the structure. The formation of a natural tombolo is also doubtful because the waves at Buhne Point spit and littoral material from upcoast may not migrate to the lee of the breakwater.



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
211 MAIN STREET  
SAN FRANCISCO, CALIFORNIA 94105

April 25, 1984

Construction-Operations Division

Dear

This is to confirm the Buhne Point Demonstration Project Steering Committee Meeting to be held at the Humboldt Bay Harbor Recreation and Conservation District Office on May 16, 1984 at 1:00 p.m.

Minutes of Steering Committee Meeting #6 and Agenda for Steering Committee Meeting #7 are attached.

The following persons have been invited to attend this meeting:

Ervin Renner	Humboldt County Board of Supervisors
Dave Eyres	Federal Highway Administration
Tom Smith	Federal Highway Administration
Jack Alderson	Humboldt Bay Harbor Recreation &
Robert Davenport	Conservation District
Guy Kulstad	County of Humboldt
John Murray	County of Humboldt
Don Tuttle	County of Humboldt
George Armstrong	California Department of Boating
	and Waterways
Ed Weeks	Pacific Gas and Electric Company
Mrs. Scott	King Salmon Area Resident
Claude Wong	Los Angeles District, Corps of Engineers
Don Spencer	Los Angeles District, Corps of Engineers
Jack Farless	San Francisco District, Corps of Engineers
Jack McKellar	Eureka Project Office, San Francisco
	District, Corps of Engineers
Dick Leatherman	Eureka Project Office, San Francisco District,
	Corps of Engineers
Richard Rayburn	California Coastal Commission

Sincerely,

Jack E. Farless  
Project Manager  
Buhne Point

Attachments



**AGENDA**

**Buhne Point Steering Committee**

**Meeting #7**

**May 16, 1984**

1. Review of Steering Committee Minutes of Meeting #6.
2. Construction Schedule Update.
  - a. Phase I (Humboldt County)
  - b. Phase II (USACE-SF)
  - c. Phase III (USACE-LA)
    - (1) Design - Plans & Specifications
    - (2) Advertising and Construction Schedule
3. Proposed Monitoring Program (USACE-LA)
4. Proposed Vegetation Program (USACE-LA)
5. Buhne Drive Reconstruction Program (Humboldt County)
  - a. Status of utility relocation
  - b. Road design and improvements
  - c. Construction Schedule
6. Phase III Permit Actions and Easements (Humboldt Harbor District and Humboldt County)
7. Open to other discussion items.

MINUTES

BUHNE POINT STEERING COMMITTEE

MEETING #6

March 21, 1984

PRESENT:

<u>Name</u>	<u>Organization</u>
Dave Eyres	Federal Highway Administration
Jack Farless	Corps of Engineers, San Francisco
Jack Alderson	Humboldt Bay Harbor District
Claude Wong	Corps of Engineers, Los Angeles
Tim Kashuba	Corps of Engineers, Los Angeles
Ron Jespersen	Calif. Dept. of Boating & Waterways
George Armstrong	Calif. Dept. of Boating & Waterways
Guy C. Kulstad	Humboldt County Public Works
Richard Oglesby	Humboldt County Public Works
Ed Weeks	P.G.&E., Humboldt Bay Power Plant
Gene Schnell	P.G.&E. Eureka
John Murray	Humboldt County Public Works
Mrs. W. T. Scott	King Salmon Resident
James A. Gast	Humboldt Bay Harbor District
Richard K. Leatherman	Corps of Engineers, Eureka
William Van Peeters	Corps of Engineers, Los Angeles

The meeting was called to order by Dave Eyres at 1:00 p.m.

1. Review of Steering Committee Minutes of Meeting #5. The minutes were approved as submitted.

2. Construction Schedule Update.

a. Phase II - Replacement of Buhne Spit with dredged material from Middle Ground Area. Jack Farless reported that the contractor is a bit behind schedule at present but that the dredge should arrive sometime on Saturday, March 24, and begin dredging the following Monday or Tuesday. Plans have been modified to use a hopper dredge in the borrow areas at no extra cost. Cost will be determined by the volume of material measured in each bin of the hopper dredge. A government employee will be on the dredge at all times to measure quantity of material. Two more borrow sites have been added. The contractor will continue to utilize the primary borrow site on east side of North Bay Channel in Middle Ground Area whenever possible. Dredging is restricted to 30 feet MLLW in this site.

b. As discussed at the last meeting, additional rock has been added along the road for protection. This rock will be removed at the beginning of Phase III construction.

c. Mr. Jack Alderson reported that the problem of the North Breakwater extending onto P.G.&E. property has been solved. A metes and bounds description has been drawn up. P.G.&E. can now transfer that property to the Harbor District, to be leased back to P.G.&E. for maintenance of the riprap. The Harbor District will be able to provide the Corps of Engineers the easements and rights in approximately one month.

d. Mr. Farless stated that a Design Memorandum for the Phase III design has been furnished to all agencies concerned explaining work to be done on the existing groin and the North Breakwater. Mr. Farless said that several work areas would be required for Phase III. A discussion followed and it was decided that if the north parking lot and an area at the other end are unoccupied, these areas would be utilized, mainly for storage purposes.

e. A discussion was held on the possible need of more filter fabric to protect the toe rock. It was decided that an investigation would be made to make sure that the present plan to place filter fabric on the fill side of the wall will be sufficient or if it will be necessary to bring the fabric down further and/or add more fabric in another area. It is also possible that this could be worked among the contractors.

### 3. Physical Model Study. Update (USACE - LA)

a. Mr. Tim Kashuba passed out drawings depicting breakwater concepts for the stabilization of the sandfill. The offshore breakwater plan would be the most costly due to the fact that it would use more rock and require a land based construction project and the construction of a road. The offshore breakwater plan would cost approximately 1.74 million dollars. The shore connected breakwater plan would cost approximately 1.3 million dollars and would be cheaper to maintain. The recommendation is for the shore connected breakwater plan. (See Incl #1)

b. A 4-6 foot fabric wind fence is proposed to minimize blowing sand for King Salmon residents. The fence would be removed at a later date. A discussion followed on the placement of points of access in the fence. It was decided that the community's needs would be taken into consideration.

c. Some concern was expressed by Humboldt County about access to their rock along Buhne Drive since they plan to remove it before reconstruction of road. They expressed hope that most of the rock could be used in Phase III (i.e. sell rock to Corps contractor). It was decided that the fence would be so located to minimize access problems for removal of the stone.

d. Mr. Farless brought out that the project model is still in place but can only be kept up for several more months before there will be a charge. It will be necessary to decide what will be done with it in the near future. The Corps will send letter to their Waterways Experiment Station to determine how long the models can remain without incurring additional costs.

#### 4. Proposed Monitoring Program (USACE - LA)

a. Mr. Kashuba passed out the Buhne Point Shoreline Erosion Demonstration Project Draft Monitoring Proposal of March 1984. He explained that a hydrographic survey would be done two times a year to calculate erosion. An aerial survey will be conducted two times a year to show configuration and monitor volume changes and there will be several sand sampling sites. Littoral environment observations (LEO) reports will monitor the environment that influences sand movement and will be filled out on a voluntary basis. A short discussion was held on the cost data contained in the Draft Monitoring Proposal.

b. A concern was expressed that the biological monitoring might not be sufficient as it would begin late in the program leaving only one year to monitor and any vegetation would need at least a two year monitoring program to see if regeneration is taking place.

c. A short discussion was held on where all the raw data on the project should be kept. It was decided that all records would be kept by the Harbor District.

#### 5. Proposed Vegetation Plan of Replaced Spit Area (USACE - LA)

a. A slide show was presented by Mr. William Van Peeters depicting some of the 30 species of plant life proposed for the project and to be planted in the Fall of 1985. Out of the 30 species only about 6 will be chosen. The criteria for the choice of species to be used will be for those that can stand trampling and salinity. It will also be taken into consideration which species have done well in this area.

b. Two basic methods of seeding were investigated, hydroseeding and the roll-mat method. The roll-mat method is very expensive and so was eliminated for that reason. The proposed method is a combination of hydroseeding and sprig planting. It was brought out that the cost of planting could be greatly reduced by having local residents, college students and organizations like the California Conservation Corps help with the planting using seeds from or transplanting species already growing in this area. A sand fence will be installed with various access points to protect residents from blowing sand until vegetation takes hold. The fence will also protect the vegetation from people and vehicles until it is established.

c. A lengthy discussion was held on the study of benthic invertebrates. Mr. Van Peeters brought out that for parametric statistics, 15 to 20 replicates would be required. To monitor changes in habitat type, only 3 to 4 replicates would be needed. The cost would be approximately \$10,000 for a non quantitative qualitative type of investigation and approximately \$100,000 to \$150,000 to monitor population numbers. This is for a two year program. Samples would be taken by divers, most of the expense would be from the analysis of the samples which runs \$50.00 to \$75.00 per sample. It was suggested that perhaps the cost could be kept down by using college students to do some of the collecting and analyzing. The proposed plan is for a

minimum of 4 transects with three stations each located with 2 on the project site, 1 north of the site and 1 or 2 on the other side of the Fields Landing Channel in the South Bay area. This would provide a qualitative idea of what impact the project is having on the benthic invertebrate population. A discussion followed on if it is necessary to have monitoring areas off of the project site and of what value the information gathered would be and to what use it would be put. The San Francisco District in conjunction with FHA and the Harbor District will make the final decision on the value of the benthic invertebrates study.

6. Other Items of Discussion: Ed Weeks indicated that PG&E was going to initiate repair of their riprap along the Bay later this summer. He requested that the Phase II contractor remove pipe and equipment by June from their temporary storage area (where project signs are located) to allow access for their contractor. PG&E will defer maintenance work on the riprap in area of root of the Phase III breakwater.

The meeting was adjourned at 4:00 p.m.

The next meeting of the Buhne Point Steering Committee will be held on May 16, 1984 at 1:00 p.m. in the Conference Room at the Woodley Island Marina.

# PROJECT PLAN

The diagram is a general plan of the Humboldt Bay waterfront improvement project. It shows the following features:

- PHASE III GROIN EXTENSION:** A curved structure extending from the existing shoreline, labeled with "GROUT LIMITS" and "SANDFILL +12 ELEV".
- PHASE III BREAKWATER:** A long, straight structure extending from the groin extension towards the open bay, also labeled with "GROUT LIMITS".
- PHASE III REVETMENT:** A structure along the inner waterfront, labeled with "GROUT LIMITS".
- WINDFENCE:** A long, straight structure running parallel to the Phase III Revetment, labeled "C FABRIC".
- Streets:** Various streets are shown as dashed lines, including SALMON ST, BOND ST, COO ST, FRAS ST, and others.
- Fields Landing Channel:** A channel area shown as a dashed line.
- North Arrow:** A simple arrow pointing upwards, labeled "N".
- NOT TO SCALE:** A note indicating that the plan is not to scale.

**Figure 4**



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
**211 MAIN STREET**  
**SAN FRANCISCO, CALIFORNIA 94108**

June 22, 1984

Construction-Operations Division

Dear

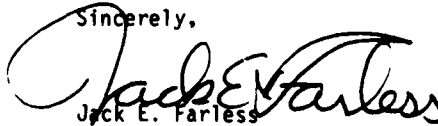
This is to confirm the Buhne Point Shoreline Erosion Demonstration Project Steering Committee Meeting to be held at the Humboldt Bay Harbor Recreation and Conservation District Office on July 25, 1984, at 1:00 p.m.

Minutes of Steering Committee Meeting #7 and Agenda for Steering Committee Meeting #8 are attached.

The following persons have been invited to attend this meeting:

Ervin Renner	Humboldt County Board of Supervisors
Dave Eyres	Federal Highway Administration
Jack Alderson	Humboldt Bay Harbor District
Robert Davenport	Humboldt Bay Harbor District
James A. Gast	Humboldt Bay Harbor District
Guy Kulstad	Humboldt County Public Works
John Murray	Humboldt County Public Works
Don Tuttle	Humboldt County Public Works
George Armstrong	California Department of Boating and Waterways
Ed Weeks	Pacific Gas and Electric Company
Mrs. Scott	King Salmon Area Resident
Claude Wong	Los Angeles District, Corps of Engineers
Don Spencer	Los Angeles District, Corps of Engineers
Jack E. Farless	San Francisco District, Corps of Engineers
Jack McKellar	Eureka Project Office, San Francisco District Corps of Engineers
Dick Leatherman	Eureka Project Office, San Francisco District Corps of Engineers
Dan Ray	California Coastal Commission
Don McGregor	CalTrans, District 01
Larry Rubottom	CalTrans, District 01

Sincerely,

  
Jack E. Farless  
Project Manager  
Buhne Point

Attachments

A G E N D A

Buhne Point Steering Committee

Meeting #8

July 25, 1984

1. Review of Steering Committee Minutes of Meeting #7
2. Construction Schedule Update
  - a. Phase II (USACE-SF)
  - b. Phase III (USACE-SF/LA)
    - (1) Bid results
    - (2) Design - Plans & Specifications Review
3. Monitoring Program Update (USACE-LA)
4. Vegetation Program Update (USACE-LA)
5. Buhne Drive Reconstruction Program (Humboldt County)
  - a. Status of utility relocation
  - b. Status of barrier between road & Phase II fill
6. Open to other discussion items.



MINUTES  
BUHNE POINT STEERING COMMITTEE

MEETING #7

May 16, 1984

PRESENT:

<u>Names:</u>	<u>Organization</u>
Dave Eyres	Federal Highway Administration
Jack E. Farless	Corps of Engineers, San Francisco
William Van Peeters	Corps of Engineers, Los Angeles
Andrea Pickart	Humboldt County Public Works
Donald Tuttle	Humboldt County Public Works
Guy C. Kulstad	Humboldt County Public Works
Don McGregor	CalTrans, District 01
Larry Rubottom	CalTrans, District 01
Richard K. Leatherman	Corps of Engineers, Eureka
Mrs. Perrigey	King Salmon Resident
Mrs. Scott	King Salmon Resident
Claude Wong	Corps of Engineers, Los Angeles
Tim Kashuba	Corps of Engineers, Los Angeles
Ron Jespersen	Calif. Dept. of Boating and Waterways
George Armstrong	Calif. Dept. of Boating and Waterways
John Murray	Humboldt County Public Works
Richard Oglesby	Humboldt County Public Works
Jack Nellesse	Humboldt County Public Works
Dan Ray	California Coastal Commission
James A. Gast	Humboldt Bay Harbor District
Ed Weeks	P.G. & E. Humboldt Bay Power Plant

The meeting was called to order by Dave Eyres at 1:00 p.m.

1. Review of Steering Committee Minutes of Meeting #6. Mr. Don Tuttle indicated that his name should be added to the list of attendees for that meeting. The minutes were approved as corrected.

2. Construction Schedule Update.

a. Phase I - Mr. John Murray indicated that his Phase was essentially complete with only some minor corrections needed. Mr. Murray reported that the wall was in place and had been backfilled by the Corps' contractor. The County will be working on a purchase order basis with a local contractor to place more rock at the shore-

ward end connection between the wall and the rock protection. The Phase I contractor, Tonkin Construction, has submitted a claim in the amount of \$163,000 which may result in potential litigation. This will be discussed among the principles at the close of the meeting.

b. Phase II - Mr. Jack Farless indicated that the contractor has about 40,000 yards of dredged material to go and will be completed in about 2 more days. After completion the contractor will survey the transfer area in the Bay and pick up any humps and place that material on the beach. There is a changed site condition and a defective specification claim by the contractor. The beach site will be left in basically the same condition that it is in at this time. After Phase III construction, the material will be leveled to a + 12' elevation. Mr. Farless indicated that the 600,000 plus yards in the beach fill was determined by bin measurement in the hopper dredge.

c. Phase III.

(1) Design - Plans and Specifications - Mr. Tim Kashuba indicated that he had posted the plans on the board for the participants to review at their leisure. There will be rock revetment placed on the back side of the existing groin and a 425' extension to the existing groin. A 1050' breakwater is planned for connection to the northern shoreline. Phase III also includes a wind fence which will be approximately 100' back from the road right of way. It is planned that after the breakwaters are in place, the sand fill will be graded to fill in the area. The specified rock sizes are: 2 ton for the revetment, 4 ton for the breakwater extension and 5 to 7 ton for the shore connected breakwater.

Staging of the construction was discussed by the group in detail and the consensus was that the rock work needed to be completed first so that the County and P.G. & E. would have a chance to dispose of the rock they have there.

Comments on the plans and specifications must be received by May 31, 1984. Mr. Farless indicated that he would be in the area on May 30 and would be glad to pick up comments from the local agencies.

Mr. Eyres asked that the County coordinate with the local citizens on the sand fence access points.

(2) Advertising and Construction Schedule - The Corps plans to advertise on June 18, open bids on July 30 with construction to begin in Mid-August and be completed by the end of January 1985. No planting will be done under Phase III. Dr. Gast asked if there is a catastrophic storm before construction is completed, what contingencies are there for replacement of that sand. Mr. Farless indicated that there are no contingencies in the event this happens. There would have to be another dredging contract to replace the sand. While discussing this, it was decided that it should be added to the contract that the north breakwater should be the first item initiated in the construction program. The cost estimate for Phase III is 2-3 million.

3. Proposed Monitoring Program.

Mr. Kashuba indicated that the Corps needed comments on the draft monitoring program handed out at the last meeting. Monitoring will begin at the end of Phase II. Mr. Don Tuttle asked who was doing the aerial photo work. Mr. Wong indicated that he did not know but would check when he returned to Los Angeles and relay the information to Mr. Tuttle. It was also indicated that Mr. Armstrong of Cal Boating would like the firm's name. It was indicated that Item 12 in the Draft will be redone.

4. Proposed Vegetation Program

Mr. Van Peeters indicated that the first planting has been moved up to February because of the time constraints of the project. The Corps will begin writing the service agreements and scopes next month to allow sufficient time for review and notification of the contractors. There will be three planting and collection periods to hopefully insure that the planting will take. A two year monitoring program is proposed for the vegetation program with a final report scheduled for January 1987.

A semi-final list of plants to be planted was handed out. Mr. Van Peeters indicated that he would be working with Humboldt County on collection of seeds and planting.

5. Buhne Drive Reconstruction Program

a. Status of utility relocation - Mr. John Murray indicated that this is in progress and should meet the time deadline of June 1 with residents hooking up by either July or August 1.

b. Road design and improvements - Mr. Murray indicated that the

County is not pursuing the design at this time but will start when the Corps is finished. A preliminary design and cost estimate (\$700,000) has been prepared. It was indicated that some type of barrier should be placed to keep ORV's out of the area although there should probably be access to the groins at either end.

c. Construction Schedule - Construction time will be approximately 2½ to 3 months and will hopefully be finished by June 15, 1985.

#### 6. Phase III Permit Actions and Easements

Mr. Dan Ray indicated that the Coastal Permit had been approved. Dr. Gast reported that the additional land has been purchased by the District from Eureka Shipbuilders but that the P.G. & E. transfer is still in the works. Mr. Farless indicated that the Corps Public Notice will be issued on May 18.

#### 7. Open to other discussion items

Mr. John Murray asked the Corps about rock removal. Mr. Farless indicated that he felt it was risky to have the rock removed prior to Phase III construction. Mr. Armstrong reported that the study shows that erosion occurs at the rate of 27' per year and indicated that he felt rock could be taken up to the angle point from the groin end of the project. Mr. Farless indicated that the Corps could not stop either Humboldt County or P.G. & E. from removing rock but if there is a problem the Corps would not be responsible for any sand loss. Dr. Gast reported that the Harbor District has no problem with removal of rock to the angle point. The Corps will be reviewing the erosion statistics prepared by Mr. Tuttle and Mr. Armstrong. Mr. Kulstad indicated that he was getting pissed off and would relate this further in the private session after the meeting. Mr. Ed Weeks asked when P.G. & E. might be able to remove their rock. The Corps indicated that it could be as early as Mid-October or as late as early November.

The meeting adjourned at 3:25 p.m.

The next meeting of the Buhne Point Steering Committee will be held on July 25, 1984, at 1:00 p.m. in the Conference Room, Woodley Island Marina.



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
**211 MAIN STREET**  
**SAN FRANCISCO, CALIFORNIA 94105**

August 24, 1984

Construction-Operations Division

Dear

This is to confirm the Buhne Point Shoreline Erosion Demonstration Project Steering Committee Meeting to be held at the Humboldt Bay Harbor Recreation and Conservation District Office on September 19, 1984, at 1:00pm.

Minutes of Steering Committee Meeting #8 and Agenda for Steering Committee Meeting #9 are attached.

The following persons have been invited to attend this meeting:

Ervin Renner	Humboldt County Board of Supervisors
Dave Eyres	Federal Highway Administration
Jack Alderson	Humboldt Bay Harbor District
Robert Davenport	Humboldt Bay Harbor District
James A. Gast	Humboldt Bay Harbor District
Guy Kulstad	Humboldt County Public Works
John Murray	Humboldt County Public Works
Don Tuttle	Humboldt County Public Works
George Armstrong	California Department of Boating and Waterways
Gene Schnell	Pacific Gas & Electric Company
Ed Weeks	Pacific Gas & Electric Company
Mrs. Scott	King Salmon Area Resident
Wayne Schmalz	King Salmon Area Resident
Mrs. Perriguy	King Salmon Area Resident
Claud Wong	Los Angeles District, Corps of Engineers
Don Spencer	Los Angeles District, Corps of Engineers
Jack E. Farless	San Francisco District, Corps of Engineers
Jack McKellar	Eureka Project office, San Francisco District Corps of Engineers
Dick Leatherman	Eureka Project Office, San Francisco District Corps of Engineers
Bruce Fodge	California Coastal Commission
Don McGregor	CalTrans, District 01
Larry Rubottom	CalTrans, District 01

Sincerely,

Jack E. Farless  
Project Manager, Buhne Point

Attachments

# Minutes

## Buhne Point Steering Committee Meeting #8

July 25, 1984

### Present:

David Eyres	Federal Highway Administration
Jack E. Farless	U.S. Army Corps of Engineers, San Francisco
Mrs. Wm. Scott	King Salmon Resident
Mrs. Chas. Perriguet	King Salmon Resident
Mrs. Wayne Schmalz	King Salmon Resident
Wayne C. Schmalz	King Salmon Resident
William Van Peeters	U.S. Army Corps of Engineers, Los Angeles
Donald C. Tuttle	Humboldt Co. Dept. of Public Works
Andrea Pickart	Humboldt Co. Dept. of Public Works
Guy C. Kulstad	Humboldt Co. Dept. of Public Works
Richard Oglesby	Humboldt Co. Dept. of Public Works
Pete Pettersen	CalTrans District 01
George A. Armstrong	Ca. Dept. of Boating and Waterways
James A. Gast	Humboldt Bay Harbor District
Claude Wong	U.S. Army Corps of Engineers, Los Angeles
Dean Ray	Coastal Commission, Eureka
Ervin Renner	Humboldt Co. Board of Supervisors
Gene Schnell	Pacific Gas & Electric Co., Eureka

1. Meeting called to order by David Eyres at 1:10pm.
2. Minutes of Meeting #7 were approved as submitted.
3. Construction Schedule Update - Mr. Farless indicated the County has completed Phase II. A claim is still being discussed with the contractor on Phase II.

The bids were opened July 24, 1984, for the construction of Phase III. There were five bidders, the high bid of 2,899,115 dollars and the low bid of 2,455,950 dollars; the government estimate was 3,090,040. The low bidder was Stimple, Baker and Associates, from Redding, California. The second bidder was McAmis from Chico, at 2,503,709 dollars. The third low bidder was Tonkin Construction at 2,800,000 dollars; the next bidder was Mercer-Fraser at 2,801,210. The high bidder was Roy Garren Corp. at 2,899,115 dollars.

Stone source proposed by the contractor was unknown at time of meeting. Mr. Kulstad wanted the record to indicate that faulty reports are being put out on the quality of the County stone along Buhne Drive that the stone has been tested and meets the specifications.

Award of the Contract will be held by the Corps until the County votes to sell the stone on Tuesday, the 31st of July. Tentative dates for the Award from the Corps will be August 1st or 2nd.

The inner range Marker for the Entrance Channel along the south spit will have to be moved. Arrangements for this move is being coordinated with the Coast Guard.

It was discussed at length as to the height of the dunes to be produced and it was decided to reduce the height from +16' to +14'. Mr. Van Peeters stated that the design drawings were misleading as to what the dunes would look like. Mr. Farless requested that the drawings of the dunes be re-done, and a copy provided to Mr. Alderson.

A tentative long-term schedule was worked out by Mr. Farless, and it appears that the project will be transferred for operation and maintenance to the District by August of 1987. The Monitoring Program will start as soon as the construction of Phase III is completed. The Physical Monitoring will be completed about 31 January 1987, and the Final Report due 30 April 1987. The Vegetation Program will be completed about February of 1987.

4. Vegetation Program Update. Mr. Van Peeters brought in several plants that he found on the site. He stated that the plants were ready to go to seed and that they will be collecting seeds until October. The first phase of planting will be accomplished in February 1985. The Corps of Engineers will contract with the County Public Works Department to accomplish the seed collection and planting.
5. Monitoring Program Update. Mr. Claude Wong handed out copies of the Monitoring Program. This program is based on a two year schedule to begin at the completion of the Phase III project. There were five items covered in his update. 1. The Hydrographic and Foreshore Surveys - will be done twice a year and after major storms. The hydro surveys will be extended to include the old Buhne Point Shelf. 2. Aerial Surveys - will give a broader picture, and may also see discharge from PG&E. 3. Sand Sampling and Analysis - it was decided that two of the sand sampling locations were to be moved to each side of the opening and a sampling location added at the middle of the rubble mound structures. One sampling location was added at the end of Herring Street, and a sampling location added on bay side of the north shore attached breakwater. 4. LCO Data Collection Program - material will be provided by the Corps, this will help determine wave action against the groins. Mr. Wong will bring materials to next meeting for training session on Data Collection. Mr. Wayne Schmalz volunteered to be the coordinator

for the Data Collection. 6. Site Inspection - will be accomplished by the Corps of Engineers, San Francisco District, twice a year, and document all data collected.

6. Buhne Drive Reconstruction Program (Humboldt County) - A. Status of Utility Relocation: PG&E is taking the transformers down and Pacific Bell will handle the poles, etc. B. Status of Barriers Between Road & Phase II Fill: Mr. Farless will leave it up to the District and the County to coordinate the design of the barriers. Dr. Gast request that removable barriers at both end for vehicle access for maintenance equipment. Mr. Farless stated it would be up to the District to put up any signs for the area.

Mr. Farless informed Dr. Gast that the Corps still needs the construction easement for the shore attached breakwater to be constructed at north end of project.

7. Open to Other Discussion items - none.
8. The next meeting is schedule for 19 September 1984. This meeting will also be a training session for the LEO Program and a Steering Committee Meeting.
9. Adjournment: 3:06pm.



## A G E N D A

Buhne Point Steering Committee

Meeting #9

Sept. 19, 1984

1. Review of Steering Committee Minutes of Meeting #8
2. Construction Schedule Update
  - a. Phase III (USACE-SF)
    - (1) Status of Construction
3. Vegetation Program Update (USACE-LA)
4. Buhne Drive Reconstruction Program (Humboldt County)
  - a. Status of utility relocation
  - b. Status of barrier between road and Phase II fill
5. Open to other discussion items
6. LEO Data Collection Program (USACE-LA)
  - a. Adjournment of meeting and relocate at Buhne Point Sand Fill for training session.



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
**211 MAIN STREET**  
**SAN FRANCISCO, CALIFORNIA 94105**

06 November 1984

Construction-Operations Division

Dear

This is to confirm the Buhne Point Shoreline Erosion Demonstration Project Steering Committee Meeting #10 to be held at the Humboldt Bay Harbor Recreation and Conservation District Office on November 28, 1984, at 1:00 p.m.

Minutes of Steering Committee Meeting #9 and Agenda for Steering Committee Meeting #10 are attached.

The following persons have been invited to attend this meeting:

Ervin Renner	Humboldt County Board of Supervisors
Dave Eyres	Federal Highway Administration
Jack Alderson	Humboldt Bay Harbor District
Robert Davenport	Humboldt Bay Harbor District
James A. Gast	Humboldt Bay Harbor District
Guy Kulstad	Humboldt County Public Works
John Murray	Humboldt County Public Works
Don Tuttle	Humboldt County Public Works
George Armstrong	California Dept. of Boating and Waterways
Gene Schnell	Pacific Gas & Electric Company
Ed Weeks	Pacific Gas & Electric Company
Mrs. Scott	King Salmon Area Resident
Wayne Schmalz	King Salmon Area Resident
Mrs. Perrigues	King Salmon Area Resident
Tim Kashuba	Los Angeles District, Corps of Engineers
Don Spencer	Los Angeles District, Corps of Engineers
Jack McKellar	Eureka Project Office, S.F. Dist. Corps of Engineers
Dick Leatherman	Eureka Project Office, S.F. Dist. Corps of Engineers
Bruce Fodge	California Coastal Commission
Don McGregor	Cal Trans, District 01
Larry Rubottom	Cal Trans, District 01

Sincerely,

Jack E. Farless, Project Manager  
Buhne Point

Attachments

Minutes

Buhne Point Steering Committee Meeting #9

September 19, 1984

Present:

David Eyres	Federal Highway Administration
Mrs. Wm. Scott	King Salmon Resident
Mrs. Chas. Perriguet	King Salmon Resident
Mrs. Wayne Schmalz	King Salmon Resident
Jack E. Farless	U.S. Army Corps of Engineers, San Francisco
Tim Kashuba	U.S. Army Corps of Engineers, Los Angeles
Robert Clancy	U.S. Army Corps of Engineers, Los Angeles
Ed Weeks	Pacific Gas & Electric Co., Eureka
Bruce Fodge	California Coastal Commission
Gene Schnell	Pacific Gas & Electric Co., Eureka
John Murray	Humboldt County
Leon Hamilton	Humboldt County
Pete Petterson	Cal Trans District 01
Rick Storre	Humboldt Bay Harbor District

1. Meeting called to order by David Eyres at 1:03 p.m.
2. Minutes of Meeting #8 were approved as submitted.
3. Construction Schedule Update - Mr. Farless indicated Stimpel-Baker & Associates had started placement of the core & bedding stone at the Shore Attached Breakwater, but the Corps stopped them due to the material being out of specification. Excessive material passing the #200 sieve was creating a water quality problem. The Contractor's proposed schedule is to start on the Shore Attached Breakwater from Station 0+00 to 4+85 with the core and bedding, stone, then go back to place the various layers of armor stone, he'll extend another section of the core and bedding stone and keep working out and protect what he has already completed.

Mr. Farless requested a copy of the agreement between the County and the contractor for the armor stone to be used.

Mr. Murray indicated a couple of concerns about the stone, such as the sale of the rock, and that Mr. McKellar had indicated that 20 to 30% of the rock was unacceptable. Mr. Murray requested that the rock from the revetment that is acceptable for use in the breakwater be marked. Meetings with Humboldt County to discuss acceptability of the armor stone will be schedule as required by the Eureka Resident Office.

4. Vegetation Program Update (USACE-LA) - Mr. Farless stated that Los Angeles District is finalizing the program, putting it together in a published form to be distributed at the next meeting. Mr. Murray stated that the County has entered into the agreement to gather the seeds.

Mr. Farless indicated that the Corps of Engineers has a contract with the County for \$5,244 for the County to collect the seeds for the first phase of planting.

5. Buhne Drive Reconstruction Program (Humboldt County) - Mr. Murray indicated the P.G. & E. has completed the work to hook up the underground utilities but there are still a few residents that have not done the work to their property for the hook up.

The barrier between the road and phase II fill is at the request of the Harbor District and Corps of Engineers to keep off road vehicles from beach area. It will be up to the Harbor District to let the County know what they want.

6. LEO Data Collection Program (USACE-LA) - Mr. Farless handed out a pamphlet on the monitoring program and stated that they would be publishing the final version of the vegetation program.

Mr. Clancy gave a short description of the instruments used in the data collection.

The problem of finding someone to do the monitoring was discussed.

7. The next meeting is scheduled for 28 November 1984.

8. Adjournment at 1:38 p.m.

A G E N D A

Buhne Point Steering Committee

Meeting #10

November 28, 1984

1. Review of Steering Committee Minutes of Meeting #9
2. Construction Schedule Update
  - a. Phase III (USACE-SF)
    - (1) Status of Construction
3. Vegetation Program Update (USACE-LA) & (Humboldt County)
4. LEO Data Collection Program (USACE-LA)
5. Buhne Drive Reconstruction Program (Humboldt County)
  - a. Status of utility relocation
  - b. Status of barrier between road and Phase II fill
6. Open to other discussion items



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
211 MAIN STREET  
SAN FRANCISCO, CALIFORNIA 94108

07 March 1985

Construction-Operations Division

Dear

This is to confirm the Buhne Point Shoreline Erosion Demonstration Project Steering Committee Meeting #12 to be held at the PG&E Auditorium on 26 March 1985, at 11:00 a.m.

The purpose of this meeting will be to conduct a final inspection of the Phase II Sandfill and Phase III construction of the groins. All attendees will meet at the PG&E Auditorium and then proceed to the construction site. Minutes of Steering Committee Meeting #11 are attached.

The following persons have been invited to attend this meeting:

Ervin Renner	Humboldt County Board of Supervisors
Dave Eyres	Federal Highway Administration
Jack Alderson	Humboldt Bay Harbor District
James A. Gast	Humboldt Bay Harbor District
Guy Kulstad	Humboldt County Public Works
John Murray	Humboldt County Public Works
Don tuttle	Humboldt County Public Works
George Armstrong	California Dept. of Boating and Waterways
Ronald Jespersen	California Dept. of Boating and Waterways
Gene Schnell	Pacific Gas & Electric Company
Ed Weeks	Pacific Gas & Electric Company
Mrs. Scott	King Salmon Area Resident
Mrs. Schmalz	King Salmon Area Resident
Mrs. Perriguy	King Salmon Area Resident
Ms. Nora Kim	Los Angeles District, Corps of Engineers
Dan Muslin	Los Angeles District, Corps of Engineers
Jack McKellar	Eureka Resident Office, S.F. Dist Corps of Engineers
Dick Leatherman	Eureka Resident Office, S.F. Dist Corps of Engineers
Bruce Fodge	California Coastal Commission

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. Pete Pettersen  
. A.E. Wanket  
. Dave Fulton

Cal Trans, District 01  
Corps of Engineers - South Pacific Division  
Corps of Engineers - South Pacific Division

Sincerely,

A handwritten signature in cursive script, reading "Jack E. Farless". The signature is written in dark ink and is positioned above the printed name and title.

Jack E. Farless, Project Manager  
Buhne Point

Attachments

### Minutes

#### Buhne Point Steering Committee Meeting #11

February 20, 1985

#### Present:

David Eyres	Federal Highway Administration
Jack Farless	U.S. Army Corps of Engineers, San Francisco
George Armstrong	Calif. Dept. Boating & Waterways
Ronald Jespersen	Calif. Dept. Boating & Waterways
Nora Kim	U.S. Army Corps of Engineers, Los Angeles
Pete Pettersen	Cal Trans District 01
John Murray	Humboldt County Dept. of Public Works
Jack Alderson	Humboldt County Dept. of Public Works
Leon Hamilton	Humboldt County Dept. of Public Works
Darrel Richardson	P.G.&E. Humboldt Bay Power Plant
Bruce Fodge	California Coastal Commission
Richard Leatherman	U.S. Army Corps of Engineers, Eureka Resident Office
Tom Smith	U.S. Army Corps of Engineers, Eureka Resident Office
Andrea Pickart	Humboldt County Dept. of Public Works
Donald Tuttle	Humboldt County Dept. of Public Works
Mrs. Wm. Scott	King Salmon Resident
Mrs. C.D. Periguy	King Salmon Resident
Mrs. W. Schmalz	King Salmon Resident
Robert Clancy	U.S. Army Corps of Engineers, Los Angeles
John Azeveda	U.S. Army Corps of Engineers, San Francisco
Ronald Pearson	P.G.&E. Humboldt Bay Power Plant
Gene Schnell	P.G.&E. Humboldt Bay Power Plant
Bill Greenwood	King Salmon Resident

1. Meeting called to order by David Eyres at 1:03 p.m.
2. Minutes of Meeting #10 were approved as corrected by Mr. Don Tuttle. A revised page 2 is provided for substitution in Minutes of Meeting #10.
3. Construction Schedule Update - Mr. Farless indicated that Phase III construction was on schedule and would be completed around mid-March.

Tom Smith indicated that the scheduled rock placement was completed. The major work remaining is the grouting and fencing. Fencing will start next week and should take about ten (10) working days to complete. There will be two (2) types of fences both four (4) feet high. One will be a wood slat fence which will run along the length of the beach and the other will be a three (3) strand wire fence which will enclose the dunes and planting area. Mr. Smith also mentioned that they were having a problem with a definition of who can have access out there. There has been a problem with four wheelers and motorcycles, when the Sheriff's department was contacted, they stated that they do not have any jurisdiction because its not posted for no trespassing. There was a discussion held and it was decided that it would be up to the Harbor District, being the property owner, to have the posting done. Jack Alderson stated that the Harbor District could pass their own Ordinance as to who can and can't have access to their property, and that he would have this placed on the next agenda for the Board of Commissioners.



There was a discussion held on the number, types, sizes and locations of gates and accesses to the beach, groin and planting areas, these are to be temporary.

Mr. Smith gave a short update on the grouting. He indicated the groin was being drilled and grouted on 10 foot centers, then 5 foot centers and if necessary on 2-1/2 foot centers.

4. Vegetation Program Update - Mr. Tuttle of the County stated that all information gathered together through the seed collection and testing has been put together into a report and is now available to any interested persons. The Planting scope is complete and under contract with the Corps of Engineers. Ms. Pickart reminded everyone that the planting is going to be scaled down, and that's mainly from the planting at an unfavorable time of the year, and the amount of seed gathered. The first planting is scheduled for the last two (2) weeks of March. The planting has three (3) major elements to it. First, the native dune grass that will be planted on the windward side of the crests of the dunes as a stabilizer, second, will be a seed mix, the third one will also be seed mix but will be used for the purpose of monitoring. The labor will be from the California Conservation Corps. Mr. Tuttle indicated the Benthic Monitoring program should be accomplished by Humboldt State.
5. LEO Data Collection Program - Mr. Farless stated that the question of man power to do the monitoring has been resolved. He indicated that Dr. James Gast, a member of the Board of Commissioners and a teacher at Humboldt State University, has contracted two (2) students from Humboldt State University to do the monitoring. Ms. Kim has worked up a scope and is starting a contract for two (2) students for a period of 360 days, one student will do it one month and the other will do it the next, alternating. Ms. Kim indicated that Mr. Clancy had held a monitoring class this morning but that no students showed up because of mid-terms, Dr. Gast did, however, and Mr. Clancy felt that Dr. Gast had a good handle as to what is going on and that he would be a good local trainer and coordinator for the monitoring program. Mr. Farless stated that there will be back-up monitors through the Corps office locally. The contract with the students will be for two (2) hours a day at \$8.00 per hour, 20 days a month, under a personal service contract. The monitoring program is scheduled to start the first of April.
6. Buhne Drive Reconstruction Program - Mr. Murray of the County indicated that they have a tentative design but nothing finalized. The design will be submitted to FHWA in approximately 6 weeks. There will be a five (5) foot sidewalk on either side, a forty (40) foot paved street and on the west side of the road will be a two (2) foot high, nine (9) inch wide barrier. Mr. Eyres indicated that it would be up to the County and the Harbor District to decide where the final accesses will be in the barrier, also the access to the P.G. & E. property at the north end.

Mr. Murray asked the local residents present if they thought it was a good idea to have a meeting at South Bay School for the local residents to tell them what will be happening and when, they indicated that that would be an excellent idea. He also mentioned that a test was done prior to all this construction as to what kind of shape Buhne Drive was in, and that they plan to do the test again to see how much deterioration has occurred with all the heavy traffic, visually there seems to be quite a bit. He indicated that they were now talking about overlaying the road all the way up to Highway 101. Mr. Eyres told him to submit a written request as soon as possible. A total of \$800,000 has been reserved for the road construction program.

7. Open to other discussion items - Mr. Farless stated that he had received a claim from the Phase II dredging contractor for \$485,000.

Mr. Jespersen inquired about a claim against the Phase I portion of the project being processed through the courts that might have been impacted by Phase II. Mr. Murray indicated that their contractor completely by-passed the normal claim procedure and went immediately to court. They are expecting results by the end of the month. If the County gets stuck having to award payment to the contractor that they are going to have to come back to the Corps. The main reason for the contractor's claim was the Corps' inability to get their dredging contractor in there and the County would hope to recover cost. The total claim is \$123,000, with a settlement cost of approximately \$30,000.

Mr. Tuttle asked Mr. Farless about the turn around time for payments on contracts, as the County had submitted a request on the 27th of December and had not heard anything back on it. Mr. Farless indicated that he was ready to pay it but that he had not seen a request as yet. He asked that the County resubmit and send a copy directly to him in San Francisco.

Mr. Alderson indicated that the Harbor District would like to have some kind of Dedication Ceremony around mid-May. He also stated that he would like to attend the meeting of the local residents so that he may speak to them to request their cooperation about the planting of the vegetation and the new ordinance against the off-road vehicles, and the possibility of forming an Ad Hoc Committee, for the park area.

8. Due to scheduling problems, next meeting date is subsequently changed from 27 March to 26 March 1985, at 11:00 a.m.
9. Meeting adjourned: 2:18 p.m.

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4. Buhne Drive Reconstruction Program Update - Mr. Murray reported that the movement of the utilities is completed. A majority of the rock has been removed with no damage to the water lines. Mr. Farless indicated that there are a few holes left out there that will have to be filled in, for safety.

The status of the barrier between the road and Phase II fill - the County's understanding is that once the barrier is in, it is the responsibility, both from the liability standpoint and whether it functions adequately, for the Harbor District, and that they were opting for their opinion of what they would like to be constructed there. Jack Alderson indicated that the Board of Commissioners were meeting this Thursday and would discuss it then.

Mr. Murray indicated that they have not really started on the road design as yet, and that they really can't start until they can see where the dunes are going, but that once that is completed that a road design could be into the Federal Highways Administration by mid-February.

5. Vegetation Program Update - Mr. Farless stated that the Corps has the final working draft (copies provided to Jack Alderson and Donald Tuttle), but that it still has to be approved by the District Office of the Corps. The revisions to the dune's height has been made and also Mr. Van Peeters has redesigned the dikes to keep them more open so people can pass through. He indicated the construction contractor will soon be asked for cost proposal for this change to dune heights.

Mr. Don Tuttle of the County reported that information obtained on seed collection through a sample test showed we would not be able to collect 100 lbs. of seed in the time allotted in the contract. Also they found during the processing a lot of pods had no seeds because of aborting, or insects ate them. The diversity of the four seed collection sites available is not optimum. There was a problem with some of the species not being ready for harvesting at the beginning of September and then the heavy rains made collection impossible because you can't collect seeds when the plants are wet. The processing time took much longer than anticipated, which means they couldn't put as much effort into the seed collection as hoped. Mr. Tuttle stated that they had collected approximately 55 lbs. of potentially viable seed and have spent approximately \$4,500 as of October, leaving \$700. Although this gathering did not have any impact on the seed source, a gathering of once a year may very well have an impact on the seed source.



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
**211 MAIN STREET**  
**SAN FRANCISCO, CALIFORNIA 94105**

May 01, 1985

Construction-Operations Division

Dear

This is to confirm the Buhne Point Shoreline Erosion Demonstration Project Steering Committee Meeting #13 to be held at the Humboldt Bay Harbor Recreation and Conservation District Offices on June 12, 1985, at 1:00 p.m.

Minutes of Steering Committee Meeting #12 and Agenda for Steering Committee Meeting #13 are attached.

The following persons have been invited to attend this meeting:

Ervin Renner	Humboldt County Board of Supervisors
Dave Eyres	Federal Highway Administration
Jack Alderson	Humboldt Bay Harbor District
James A. Gast	Humboldt Bay Harbor District
Guy Kulstad	Humboldt County Public Works
John Murray	Humboldt County Public Works
Don Tuttle	Humboldt County Public Works
George Armstrong	California Dept. of Boating and Waterways
Ronald Jespersen	California Dept. of Boating and Waterways
Gene Schnell	Pacific Gas & Electric Company
Ed Weeks	Pacific Gas & Electric Company
Mrs. Scott	King Salmon Area Resident
Wayne Schmalz	King Salmon Area Resident
Mrs. Perriguet	King Salmon Area Resident
Tim Kashuba	Los Angeles District Corps of Engineers
Ms. Nora Kim	Los Angeles District Corps of Engineers
Dan Muslin	Los Angeles District Corps of Engineers
Jack McKellar	Eureka Resident Office, S.F. Dist. Corps of Engineers
Dick Leatherman	Eureka Resident Office, S.F. Dist. Corps of Engineers
Bruce Fodge	California Coastal Commission
Don McGregor	Cal Trans, District 01
Larry Rubottom	Cal Trans, District 01

Sincerely,

Jack E. Farless, Project Manager  
Buhne Point

Attachments

A G E N D A

Buhne Point Steering Committee

Meeting #13

1. Review of Steering Committee Minutes of Meeting #12.
2. Vegetation Program Update USACE- SF & Humboldt County.
3. LEO Data Collection Program (USACE-LA).
4. Buhne Drive Reconstruction Program (Humboldt County).
  - a) Status of Buhne Drive Design, Plans & Specifications.
  - b) Presentation of proposed plans.
5. Open to other discussion items.

## Minutes

### Buñe Point Steering Committee Meeting #12

March 26, 1985

#### Present:

David Eyres	Federal Highway Administration
Jack Farless	U.S. Army Corps of Engineers, San Francisco
Jay Soper	U.S. Army Corps of Engineers, San Francisco
George Armstrong	California Dept. of Boating & Waterways
Ronald Jespersen	California Dept. of Boating & Waterways
Nora Kim	U.S. Army Corps of Engineers, Los Angeles
Tim Kashuba	U.S. Army Corps of Engineers, Los Angeles
Donald G. Spencer	U.S. Army Corps of Engineers, Los Angeles
Dan Muslin	U.S. Army Corps of Engineers, Los Angeles
Larry Rubottom	Cal Trans District 01
Michael Eagan	Cal Trans District 01
Darrel Richardson	P.G. & E. Humboldt Bay Power Plant
Ed Weeks	P.G. & E. Humboldt Bay Power Plant
Richard Leatherman	U.S. Army Corps of Engineers, Eureka Resident Office
Tom Smith	U.S. Army Corps of Engineers, Eureka Resident Office
Donald Tuttle	Humboldt County Dept of Public Works
Mrs. Wm. Scott	King Salmon Resident
Mrs. C.D. Perriguet	King Salmon Resident
Mrs. W. Schmalz	King Salmon Resident
Gene Schnell	P.G. & E. Humboldt Bay Power Plant
Douglas M. Pirie	U.S. Army Corps of Engineers, South Pacific Division
Dave Fulton	U.S. Army Corps of Engineers, South Pacific Division

1. Meeting called to order by David Eyres at 11:10 a.m.
2. Minutes of Meeting #11 were approved.
3. Vegetation Program Update - Mr. Farless stated a decision had been made to install an irrigation system to insure best possible conditions for growth of the Phase I planting program and to help prevent a re-occurrence of the recent blowing sand. The CofE will contract with a local firm to operate the irrigation system. Mr. Tuttle indicated the Phase I planting program is proceeding on schedule, should be complete by end of March, except for areas impacted by sprinkler piping installation. Planting on dune tops will be delayed until 15 April 1985, anticipated completion of sprinkler piping installation.

Mr. Tom Smith indicated the sprinkler system has been designed and a proposal for installation has been requested from the Phase III Construction Contractor.

Ms. Nora Kim stated extreme care should be exercised when growth starts above ground level not to disturb it with heavy irrigation from the sprinkler system. Mr. Tuttle said he would monitor the situation. Humboldt County placed Danger Signs around the fenced planting areas to warn trespassers not to enter area.

Mr. Farless inquired about status of Harbor District action to establish an ordinance and installation of signs to legally prevent off road vehicles from the project area. Mr. Tuttle indicated the Harbor District had the first reading of proposed ordinance on 28 February 1985, with last reading on 18 March 1985. Mr. Armstrong requested a copy of the Benthic Monitoring Scope of Services. Mr. Farless will provide a copy.

4. Final Inspection of Phase III Contract. The CofE provided vehicles and rain gear for inspection of the construction site. Heavy wind driven rain was occurring at time of inspection. No specific deficiencies were identified by individuals participating in the inspection.

5. Open to other discussion items: Mrs. Schmalz expressed concern with the slight erosion which has taken place along beach between the rock groins. Mr. Farless explained a slight change in beach slope was expected and what has happened in the prototype also occurred in the hydraulic model testing program. Mrs. Scott asked about the number of pedestrian access points to beach area. Mr. Smith indicated that there are 4 such points of entry from Buhne Drive. Mr. Tuttle indicated design of road has been completed but not submitted to FHWA for review. A discussion developed about widening of road from project area to freeway to provide room for pedestrians.

Mr. Eyres indicated this section of road would not be brought to current highway standards, in effect, it will not be widened from its present width. Only an asphalt overlayment will be allowed with road edge stripes. Mr. Farless indicated if the road was widened, a Corps of Engineers Section 10 and 404 permit would be required as the road fill would encroach into navigable waters and wet lands. Mr. Tuttle indicated a public meeting was scheduled for 27 March 1985, on the road project.

6. The next meeting is scheduled for 12 June 1985, at 1:00 p.m. at the Woodley Island Marina Conference Room.

7. Adjourned: 1:15 p.m.



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
**211 MAIN STREET**  
**SAN FRANCISCO, CALIFORNIA 94108**

July 9, 1985

Construction-Operations Division

Dear

Attached for your information are the minutes of Steering Committee Meeting #13 held on June 19, 1985.

Next scheduled meeting of the Steering Committee will be October 9, 1985, at the Humboldt Bay Harbor Recreation and Conservation District Office. An agenda for this meeting will be provided at a later date.

Sincerely,

A handwritten signature in cursive script that reads "Jack E. Farless".

Jack E. Farless, Project Manager  
Buhne Point

Attachments



Minutes

Buhne Point Steering Committee Meeting #13

June 19, 1985

Present:

David Eyres	Federal Highway Administration
Jack Farless	U.S. Army Corps of Engineers, San Francisco
Jack Alderson	Humboldt Bay Harbor District
Don Tuttle	Humboldt County Natural Resources Analyst
Andrea Pickart	Humboldt county Natural Resources Analyst
Tom Smith	U.S. Army Corps of Engineers, Eureka
Richard Leatherman	U.S. Army Corps of Engineers, Eureka
John Murray	Humboldt County Public Works
Pete Petersen	Cal Trans District 01
Peter Kleskovic	Federal Highway Administration
George Armstrong	Cal Boating and Waterways
Nora Kim	U.S. Army Corps of Engineers, Los Angeles
James Gast	Humboldt Bay Harbor District
Mrs. Schmalz	King Salmon Resident
Mrs. Scott	King Salmon Resident
Gene Schnell	PG&E
Ervin Renner	Humboldt County Board of Supervisors

1. Meeting called to order by David Eyres at 1:08pm.
2. Minutes of Meeting #12 were approved.

John Murray requested that item number 4 on the agenda be changed to item number 2.

3. Buhne Drive Reconstruction Program - John Murray, of the County, reported that on June 4th they opened bids. There were three bidders, with the low bidder being Mercer Frazer at \$406,000 and was awarded the contract on June 18th. The estimate by the engineer was \$550,718. The contractor could start as early as next Monday but will probably start the first of July 1985. Mr. Eyres asked about probable completion date, the scope gives 60 working days estimating the end of September. With the supplemental work the actual completion will be October 85. There was short discussion on the type of retaining wall to be used along the west side of the road, Mr. Murray stated that the Harbor District had decided upon a 30" high 6" thick concrete wall. There will be openings opposite of each of the side streets, these openings will be walk through only. There will be a vehicle gate at each end for emergency vehicles.

Gene Schnell suggested that it would be a good idea if the County, the Harbor District and PG&E got together to discuss what was to be done about the parking lot there at the north end. Mr. Murray stated that he would want to meet after all the modifications have been completed.

4. Vegetation Program Update USACE - Jack Farless reported that a contract has been awarded to turn on the water for Phase I planting, with a low bid of \$5,700. The contract will run through November 1985. He also stated that the Corps has a contract with the County for Phase II seed collection and planting.

Mr. Farless reported that there has been a change in the Corps procurement regulations required that the Corps go out to bid on the Benthic Monitoring Program. Proposals were sent out and four were returned, the bids ranged from \$70,712 to \$155,000 all for the same scope of service. The original estimate was around \$30,000. Mr. Farless stated that he questioned the value of this program because of the cost and was looking for a consensus of the committee. A discussion was held. A general consensus of the committee came down to having the scope re-evaluated and down scoped to lessen the cost.

5. LEO Data Collection Program USACE - Nora Kim reported that she has received two months worth of data sheets, and those are being analyzed in Mississippi, they will be sending out quarterly reports back to us. Mr. Farless asked if the data collectors had been paid yet, Dr. Gast stated that they had not received anything as yet. Mr. Farless stated that the paperwork had been processed through his office and that he would check on it.

6. Vegetation Program Update Humboldt County - Ms. Pickart reported that the Phase I planting contract was completed on May 30th. The total amount spent was \$35,000 of which \$26,000 was for the irrigation system under the Corps' Phase III construction contract. Ms. Pickart showed slides of the planting and gave a brief outline of the planting process and the different kinds of planting used. The irrigation was improperly placed and has created some problems. The second seed collection is just starting and they will be collecting a total of about 300 lbs. The monitoring will continue right up until December 1985.

7. The next meeting is scheduled for October 9, 1985, at 1:00pm at the Woodley Island Marina Conference Room.

8. Adjourned: 2:26pm.



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
**211 MAIN STREET**  
**SAN FRANCISCO, CALIFORNIA 94105**

Construction-Operations Division

November 18, 1985

Attached for your information are the minutes of Steering Committee Meeting #14 held on October 9, 1985.

Next scheduled meeting of the Steering Committee will be on May 14, 1986, at the Woodley Island Marina Conference Room. An agenda for this meeting will be provided at a later date.

Attachments

A handwritten signature in cursive script, reading "Jack E. Farless".

Jack E. Farless  
Project Manager  
Buhne Point Steering Committee

MINUTES  
Buhne Point Steering Committee Meeting #14  
October 9, 1985

Present:

David Eyres	Federal Highway Administration
Jack Farless	U.S. Army Corps of Engineers, San Francisco
Don Tuttle	Humboldt County Natural Resources Analyst
Gene Schnell	PG&E
Ron Jespersen	Ca. Dept. of Boating and Waterways
Dan Knies	Humboldt County Public Works
Ed Weeks	PG&E
John Murray	Humboldt County Public Works
Pete Pettersen	Ca. Trans District 01
Michael Eagan	Ca. Trans District 01
Nora Kim	U.S. Army Corps of Engineers, Los Angeles
Jack Alderson	Humboldt Bay Harbor District
Andrea Pickart	Humboldt County Natural Resources Analyst

1. Meeting called to order by Mr. David Eyres at 1:07p.m.
2. Minutes of Meeting #13 were approved.

Mr. Eyres asked that the recoed acknowledge the passing of Mrs. Betty Scott, and that the Committee feels saddened by her passing and that the Committee appreciates all the help and support given by her.

Item 3 was changed to Item 6 as per request of Mr. Don Tuttle, as Ms. Pickart had not arrived yet.

3. LEO Data Collection Program (USACE-LA) - Ms. Nora Kim reported that she had received the first (unofficial) reports from Vicksburg. Basically, they are just breaking down all the data and so far there have been no surprises. Reports should be coming in once very four or five months and copies are available for anyone who wants them. Mr. Farless asked about the aerial survey. Ms. Kim indicated that the ground crew had been having a problem and there has been a bit of a delay and thought they could do it late this week. Mr. Farless indicated that their survey crew will be up here next week. It was indicated by Mr. Farless and Ms. Kim that they would coordinate the teams to do the survey.

Ms. Kim indicated that she has received two benthic scopes, one for the University to do it and one to be done by a constractor. She indicated that the biologist that she had talked to said a program to find out what was out there before and what the effects of the project have been on the benthic environment would be hard to tell at this point as we're starting two years after the project has started. So a one time survey would be just to document what is out there now and we assume that there was not much out there when we started. Mr. Tuttle

stated that he believed that a survey had been done by the University before the project was started and that virtually nothing was found and that it was on this basis that all the permits and such went through. Mr. Tuttle asked what was the next step would be in the survey and getting one done. Mr. Farless indicated that it would be between he and his Contracting and Supply Division. Because of the University not being small business it probably won't go to Humboldt State. Because of the cost Mr. Farless was going to try talk supply into handling it, but if they won't then the Corps will have to solicit bids from small business contractors.

Ms. Kim stated that they were going to shoot for April or May to do the survey, as this was the time the biologist stated would be best for only doing a one time survey.

4. Buhne Drive Reconstruction Program (Humboldt County) - Mr. John Murray stated that the project is basically complete. They have spent approximately \$500,000. The County has accepted the road for maintenance from the Contractor. The contract itself is not complete as they have a change order for the planting between the concrete wall and the snow fence, and that work is not to take place until it starts raining in November. Mr. Murray did state that he was extremely happy with the way it looks out at the site, and has heard nothing but good comments from the residents. He indicated that the gate will be installed on the north end of the project within two weeks. Mr. Farless asked if they had omitted the gate in at the southern end, as the present gate will be taken out once the monitoring program is complete. It was the consensus of the Committee that a gate was planned for. Mr. Murray indicated that he would apply another change order, which should cause no problem.

Mr. Murray did note one problem/occurrence that he noticed was with one of the flood gates and the foot of Halibut Street. Because of the surges and tidal action of the water there or something, the water is being held at the other end, at the manhole cover. There is no stream of water going into anyone's yard, just a puddle that surrounds the manhole that goes up and down with the surges. He stated that he felt it was properly installed.

Mr. Eyres stated that he thought the County was just breaking even, to which Mr. Murray concurred, and he asked Mr. Murray if he saw any reason for additional funds at this time. Mr. Murray stated no, that the Federal Highway Administration might be getting some back.

Mr. Farless asked about a final report from the County, its format and when it could be expected. He asked that they get it in by the first of the year and that the Corps wants an original and two copies. He indicated that he had received comments from everyone except PG&E on the draft report.

5. Open Discussion - There was a short discussion on the signs posted out there and the access of ORV's.

There was a discussion of whether there has been any sand shifting and it was the consensus that there has been no shifting. Mr. Farless indicated that on the last survey of the Fields Landing Channel there was a lot less shoaling.

Mr. Ed Weeks asked Jack Alderson about a stretch of rock that had been removed that crossed Mrs. Rouche's property over to PG&E's property. This rock used to block access to the channel entrance by vehicles, which are now using the gap as a boat launch. Mr. Weeks stated that he could see problems arising with this situation, Mr. Alderson concurred. Who's responsible was discussed. Mr. Weeks stated that he thought it would take two or three trucks of rock to cover it. It was discussed that one of the stipulations of using her property during the project was that there would be a rock wall, giving her \$5,000 worth of free erosion control for her property.

Jack Alderson brought to the attention of the Committee that his Board of Commissioners had done a Resolution Commending Mrs. Betty Scott and that the request had been made to have a plaque put in place in honor of the agencies, and citizens who created and worked on this project. Mr. Eyres asked that Mr. Farless and Mr. Alderson work it out.

Mr. Weeks also asked about a building that has become quite a hazard and asked what could be done. It was decided that the County Building Inspector and County Health Department should take care of that.

Mr. Murray asked if Mr. Farless had heard anything about the \$60,000 claim the County submitted to the Corps as per conversations between legal councils of both the Corps and the County. Mr. Farless indicated that he had not seen it but would look into it.

Mr. Farless indicated that the Corps has entered into a contract with the County for the planting coming up in November. The contract is for \$27,400 and is based on using hired labor, if the California Conservation Corps is used that will be reduced.

6. Vegetation Program Update (Humboldt County) - Ms. Pickart reported that they had collected 200 lbs. of seed this summer. There was three different types of planting used in the Phase II Planting based on what was learned in the Phase I Planting. One is the raking/hydro-mulch; the second is the hydro-seeding/hydro-mulch and third is the tractor drawn. She gave a slide presentation showing what had come up and flourished over the summer. There was a problem with the wrong type grass being mixed in with the seed. We were to place only native plants, the Elymus, and some Ammophila got mixed in with the Elymus seed by the supplier. The supplier has indicated that they will replace

the seed in the next planting. There will be a turf area at the southeast corner of the project, as per the request of the Harbor District, for heavy public use, such as a picnic area. This turf should be low maintenance as its growth is in the winter months. It is advisable to water it this year anyway.

Ms. Kim requested the first draft of their final report on the monitoring of the planting by the end of the year.

The next meeting will be May 14th, 1986, at 1:00 p.m. at the Woodley Island Marina Conference Room.

Adjourned: 2:15 p.m.



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
**211 MAIN STREET**  
**SAN FRANCISCO, CALIFORNIA 94105 - 1905**

July 30, 1986

Construction-Operations Division

Dear

Attached for your information are the minutes of Steering Committee Meeting #15 held on May 7, 1986.

Next scheduled meeting of the Steering Committee will be on October 22, 1986, at the Woodley Island Marina Conference Room. An agenda for this meeting will be provided at a later date.

Sincerely,

A handwritten signature in cursive script, reading "Jack E. Farless", is positioned above the typed name.

Jack E. Farless  
Project Manager  
Buhne Point Steering Committee

Attachments



## MINUTES

### Buhne Point Steering Committee Meeting #15 May 7, 1986

#### Present:

David Eyres	Federal Highway Administration
Jack Farless	U.S. Army Corps of Engineers, San Francisco
Don Tuttle	Humboldt County Natural Resources Analyst
Gail Newton	Botanical Consultant
Jack Alderson	Humboldt Bay Harbor District
Marge Perriguet	King Salmon Resident
Ann Schmaltz	King Salmon Resident
Nora Kim	U.S. Army Corps of Engineers, Los Angeles
Gene Schnell	P.G. & E.
Richard Leatherman	U.S. Army Corps of Engineers, Eureka
John Murray	Humboldt County Public Works
George Armstrong	Ca. Dept. of Boating & Waterways
Ron Jespersen	Ca. Dept. of Boating & Waterways
Ed Weeks	P.G. & E.

1. Meeting called to order by Mr. David Eyres at 1:07pm.
2. Minutes of Meeting #14 were approved.

Mr. Tuttle noted that one of the types of planting was left out of Andrea Pickart's report at the last meeting and requested that it be entered into the minutes. This is in regard to page 3, item 6, in the minutes of the October 9, 1986, meeting. She stated that there were three different types of planting used in Phase II, there were actually four. The type not mentioned was manual raking. (See attached for revised paragraph 6).

3. Vegetation Program Update (Humboldt County) - Ms. Gail Newton reported that the plants that were planted in the November and December planting are coming up great. She was pleased with the way the grass is greening up. She mentioned the desire to have the northern area hydro-mulched in November with the left over seed from the last planting, this would keep the cost down and would help keep the sand stabilized. She covered the problem they are having getting rid of the non-native plants that were mixed in with the purchased commercial seeds and recommends a five (5) year maintenance program to keep weeding out those non-native plants. She mentioned that she is frequently stopped by people asking what types of plants are out there. She suggests that an interpretive sign be installed identifying what is there. She also stated that she thought that the fertilization should be continued. She requested that the watering contract with her be modified to include Line A, which is not being used as per the contract. Jack Farless stated that he saw no problems with this and would look into it. She is looking into cost and practicality of the Toro 80 sprinkler heads, which would provide a larger ground coverage.

4. LEO Data Collection (USACOE-LA) - Nora Kim stated that she had received comments from everyone for the final summary report. She had on display three (3) aerial photographs of King Salmon taken over the past six months. The data collection results estimated a 2-3% loss of sand, but the sand has not shown up anywhere else either, such as outside the groins or in Fisherman's Channel. She did indicate that there will be some adjustments made on the way the data is collected.

Jack Farless stated that the dredge claim with Osberg and Matson on the sand fill at Buhne Point was settled for the amount of \$270,000.

John Murray asked Mr. Farless if there was anything else that could be done on this \$60,000 claim since the County Council has not been able to get anywhere, Mr. Farless suggested that he have his legal council call, set up a meeting and have the legal councils meet face to face.

The next meeting will be October 22, 1986, at 1:00pm at the Woodley Island Marina Conference Room.

Adjourned: 2:25 pm.

"Revision of Minutes of Meeting #14"

6. Vegetation Program Updated (Humboldt County) - Ms. Pickart reported that they had collected 200 lbs of seed this summer. There were four (4) different types of planting used in the Phase II Planting based on what was learned in the Phase I Planting. One is manual raking; the second is raking/hydro-mulch; the third is the hydro-seeding/hydro-mulch and fourth is the tractor drawn harrow. She gave a slide presentation showing what had come up and flourished over the summer. There was a problem with the wrong type grass being mixed in with the grass, seed ordered. We were to place only native plants, the Elymus, and some Ammophila got mixed in with the Elymus culms by the supplier. The supplier has indicated that they will replace the seed in the next planting. There will be a turf area at the southeast corner of the project, as per the request of the Harbor District, for heavy public use, such as a picnic area. This turf should be low maintenance as its growth is in the winter months. It is advisable to water it this year anyway.



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
**211 MAIN STREET**  
**SAN FRANCISCO, CALIFORNIA 94108**

November 18, 1986

Construction-Operations Division

Dear

Attached for your information are the minutes of Steering Committee Meeting #16 held on October 22, 1986.

Steering Committee Meeting #17 is tentatively scheduled for May 1987. You will be advised of date next April.

Sincerely,

A handwritten signature in dark ink, reading "Jack E. Farless". The signature is written in a cursive style with a large, looping initial "J".

Jack E. Farless  
Project Manager, Buhne Point

Attachments

Minutes

Buhne Point Steering Committee Meeting #16

October 22, 1986

Present:

Bill Wong	Federal Highway Administration
Jack Farless	U.S. Army Corps of Engineers, San Francisco
Andrea Pickart	Consultant for Humboldt County
Jack Alderson	Humboldt Bay Harbor District
James Colby	Humboldt Bay Harbor District
Gail Newton	Gail Newton & Associates
Don Tuttle	Humboldt County Natural Resources Analyst
Lori Holden	Humboldt County Natural Resources Analyst
Gene Schnell	PG&E
Pete Pettersen	Cal. Trans District 01
Nora Kim	U.S. Army Corps of Engineers, Los Angeles

1. Meeting called to order by Mr. Jack Farless at 1:07 p.m.

2. Minutes of Meeting #15 were approved as submitted.

3. Report on Results of Phase I & Phase II Monitoring Program - Ms. Pickart reported that the most important result that came out of the Phase I Monitoring Program concerned the germination of the different species that were used and the types of treatments used. Essentially what was found out was that in the germination process all the species were suppressed under all of the fertilized plots, however, growth was quite superior in those same plots. The greatest enhanced cover occurred under the slow release fertilizer treatment. The three classes of seeds used ranged from large to small. The Sand Verbena, which had the highest germination rate, the Beach Evening Primrose and the Beach Pea, which had seed coat dormancy, this was overcome by the Beach Pea but not by the Beach Primrose and it was concluded that these two species were not feasible for revegetation, from the larger seeds. Of the medium seeds there was the Beach Buckwheat, which had a high germination rate in the lab, but low in the field, and the Dune Tansy, which also germinated high in the lab but not in the field. The small seeds were the Beach Sagewort, and the Seaside Daisy, which all showed low germination in the field.

Ms. Pickart stated that it was unfortunate that the results of the Phase I Monitoring Program was not available when the design for the Phase II Planting was done, as a result, the Phase II Planting was educated guess work. Ms. Pickart showed some slides of the Phase II Planting, showing the results of the planting. She mentioned that the growth rate during this phase, as compared to Phase I, was quite a bit less. This was a result of over planting. There were a few problems with the size of the plot to be seeded and the seed weight its self that the contractor had problems with and had to compensate for. The specified seed application rate was 25 lbs. per acre. The actual seed application was 40 lbs. per acre. The specified fertilization rate was 500 lbs. per acre and the actual fertilization rate varied; 25-225 lbs. per acre for the hand rake plots; 800 lbs. per acre for the hand raked/hydromulched plots; 606 lbs. per acre for the hydro-seed hydromulch; and 25 lbs. per acre for the harrowed plots.

Jack Farless noted that there will be an Operation and Maintenance Manual given to the Harbor District when the project is turned over to the District. He also

noted that the Corps of Engineers has the final reports on everything except the Phase II Monitoring and that all of them have been of good quality. It was stated that Nora Kim, U.S. Army Corps of Engineers, was in the process of putting them all together in a final report.

4. Discussion of Interpretive Sign (USACE-SF) - Mr. Jack Farless commented on the beautiful art work done on the drawings of the plants for the interpretive sign. He had a draft lay out for comments from the committee. There was a lengthy discussion held and rearranging done to the satisfaction of the group. There was a discussion on the type of base to use for the sign. The original plan was a metal table with legs. It was requested by Jack Alderson that the base be a block of concrete as it would cost less to maintain. He suggested that a concrete block, with stone facing, be poured, in setting the sign and putting a metal frame around the edge for easy replacement if and when the sign is damaged. Also to have a couple of extra signs made up so that it doesn't cost as much for replacements. The placement of sign was decided to be just inside the cement wall to the right of the middle entrance. It was decided that the Corps of Engineers would give the signs to the Harbor District and the District will have the base made by a contractor. Mr. Alderson requested that a good size edge of an 1½" be left on the plaque its self for the frame to cover it. Jack Farless requested from the Harbor District that they research and retrieve drawings or plans for the frames so that the Corps does not have to duplicate the work. The color scheme for the plants have been picked out for the various parts of the plants, these may be cut back after given to the contractor doing the signs due to costs. The sign its self will have on it the various types of plants out there, a brief history of the project, the appreciation to Mrs. Scott and Mrs. Perriguet and the cooperation with all the agencies involved. The title of the project be placed in 1½" letters across the top. The background color will be light brown with dark brown lettering.

5. Phase III Planting (Humboldt County) - Lori Holden stated that because of what all came out of the Phase I and Phase II Monitoring, the Phase III Planting will be kept real simple. There will be three application rates, a high rate of 400 lbs., a medium rate of 200 lbs. and a low rate of 50 lbs. per acre for the fertilization application. The seed application rate will be reduced down to 20 lbs. per acre. One of the problems mentioned is that they will be using left over seed from last year and will be short in some species. The Phase III Planting will be the first week in December.

Mr. Jack Farless asked if the extension on the irrigation contract had gone through. Lori Holden reported that she had just recently received a letter telling her that the extension had gone through but that funding was on hold.

6. Update on Audio Visual Portion of Final Report (USACE-LA) - Nora Kim reported that the original idea was to have a public relations firm handle it, but, it was decided that because the slides, and speech are already prepared that could be done in-house as the capabilities are there within the District. The graphics people in the Corps of Engineers are putting together a cost estimate. It was reviewed by Jack Farless prior to Ms. Kim's arrival that the format for the Audio/Visual Report will be in VHS.

7. Update on Final Project Report (USACE-LA) - Nora Kim stated that she has incorporated all the comments she received from the various people who had reviewed it. The final report is done for the Phase I Monitoring and the possibility of a Phase II Monitoring needed to be talked about. She stated that she was going to make the actual monitoring reports appendixes and doing a three or four page summary to be

put into the body of the report.

8. LEO Data Collection Program (USACE-LA) - Nora Kim reported that the LEO Data Collection was over in April of this year and she had just received that last four months worth of data, a write up is being done and this too will be incorporated into the final report. The final report draft is due April 30th. This final report will include: the Final Report, the Phase I Planning, the Phase II Planning, the Phase I/Phase II Monitoring will all be appendixes, as well as the Design Memorandums, all the seed and planting reports. The Operations and Maintenance Manual will be a separate report. Mr. Farless stated that the Management Recommendations Report from the County should be incorporated into the O&M Manual.

Mr. Jack Farless asked to be updated on the O&M Manual. Ms. Kim stated that she wanted to go over the format Mr. Farless wanted for the manual. Mr. Farless stated that the first one done here was for the jetties and it told you when you should do the inspection, how you should do the inspection and what you should be looking for. To be sure that your looking from the same vantage point every year, looking for movement in rocks, because of the expense aerial surveys that won't be required, but that there should be some kind of measuring survey done. Ms. Kim asked if there was going to be any maintenance or monitoring of the beach face itself, one of the things that showed up in the surveys was there was not a good coverage of the beach. She suggested that all that needed to be done was just to have someone go out in wadders and a line to measure any changes. Mr. Farless suggested the possibility of the Corps of Engineers putting a couple of survey discs out there so that the elevation could be checked.

Mr. Farless asked Mr. Alderson what he wanted done with the left over rock at the south end. Mr. Alderson requested a couple of days to give an answer and that he would let Dick Leatherman know.

James Colby asked about the repair or replacement of the gate at the far south end of the site accessing the south groin. It presently sits partially under sand and is very difficult to get open. Mr. Farless stated that he thought that the County was suppose to put permanent gates at both ends as part of the access roads.

Mr. Wong reported that the FHWA's Beautification Package will be voted on November 10th, so we should be getting an answer back shortly.

The next meeting was left open for sometime in May, after the Final Report Draft is distributed and reviewed. Notice will be sent.

Adjourned: 2:33 p.m.



**DEPARTMENT OF THE ARMY**  
**SAN FRANCISCO DISTRICT, CORPS OF ENGINEERS**  
**211 MAIN STREET**  
**SAN FRANCISCO, CALIFORNIA 94105 - 1905**

May 8, 1987

Construction-Operations Division

Dear

Attached for your information are the minutes of Steering Committee Meeting #17 held on March 17, 1987.

Steering Committee Meeting #18 is tentatively scheduled for July 1987. A contract modification for \$12,800.91 was made on Contract DACW07-85-C-0037 with Humboldt County to accomplish the additional sand stabilization work and a modification for \$3,790.00 to Contract #DACW07-86-C-0016 with Gail Newton to perform the additional irrigation services.

Sincerely,

A handwritten signature in dark ink, appearing to read "Jack E. Farless", written over a circular stamp.

Jack E. Farless  
Project Manager, Buhne Point

Attachments



Minutes

Buhne Point Steering Committee Meeting #17

March 17, 1987

Present:

Jack Farless	U.S. Army Corps of Engineers, San Francisco
Ricardo Fuentes	California Department of Boating & Waterways
George Armstrong	California Department of Boating & Waterways
Donald G. Spencer	U.S. Army Corps of Engineers, Los Angeles
Andrea J. Pickart	Consultant for Humboldt County
Gail Newton	Gail Newton & Associates
Charlotte Hayes	Private Consultant
Lori Holden	Humboldt County Natural Resources Analyst
Loni D. Hollenback	King Salmon Area Resident
James H. Colby, Sr.	Humboldt Bay Harbor District
Jack B. Alderson	Humboldt Bay Harbor District
Gene Schnell	Eureka Resident
R.E. Davenport	Humboldt Bay Harbor District
J.A. Gast	Humboldt Bay Harbor District
Ann Schmalz	King Salmon Area Resident
Marge Perriguy	King Salmon Area Resident

1. The meeting was called to order at 1:10pm by Mr. Jack Farless.
  2. Mr. Farless announced that the purpose of this meeting was to discuss the wind blown sand problem and come up with a solution if there is one.
- Ms. Holden reported she had invited Ms. Hayes to the meeting since she had asked her to take a close look at the area. Ms. Holden passed out a brief report and indicated Ms. Hayes had a video of the area to show the group. Ms. Holden indicated that approximately 300 cubic yards of sand have blown off the beach and offered solutions to the problem. The solutions, from most to least expensive, were: putting up two rows of sand fencing, planting elaeagnus in the area between the sand fencing and irrigating the entire area through the summer months; or just planting the elaeagnus and irrigating. There are also solutions between the two alternatives. Ms. Hayes showed her video and explained what was shown and where it was located in the project area.
- Ms. Newton indicated the sand fencing would be placed so as to create a dune between the two parallel rows of fencing. The elaeagnus can be collected from local beaches and the sand fencing installed using Conservation Corps labor if they are available. The first row of sand fencing would be placed at the upper tidal limit and the second fence 30' behind that. The elaeagnus needs to be planted right away since it is no longer dormant. It was indicated that the sand fencing would only have to last one year until the elaeagnus took hold. Ms. Newton estimated that about 560' of sand fencing would be necessary plus posts every 8 feet for each line of fencing. Sand fencing

5 foot high and in 100 footrolls cost \$162.00 per roll. The posts run approximately \$2.50 each. Ms. Newton indicated she would try to place the fencing to utilize the water system currently installed. A discussion of maintenance costs for the site was held. It was estimated that it would cost approximately \$9,000 for sand fencing and posts. It was indicated that a trench should be dug behind the concrete wall to catch sand. It was also mentioned that the County should place the sand that accumulates in the road back on the site near the gate to be spread over the area where the sand fencing will be placed. During the discussion, it was indicated the Harbor District would take over responsibility for the site on August 21, 1987. A total estimate for 3 rows of sand fencing installed by the Conservation Corps with one supervisor and irrigation from planting until August 21 is \$15,000. Mr. Farless indicated that the budget would allow for a contract with Gail Newton & Associates for maintenance and additional sprinkler heads or repairs and the County for installation of the fence, planting and fertilizing. Ms. Newton indicated the area needed to be fertilized with a mixture of quick and slow release fertilizer. It was indicated the actual acreage of the planted area is not known. Mr. Spencer was asked to provide that information for the County. The fencing will be placed so that any established walkway will be left open by staggering of the fencing.

Mr. Farless reported the finished vegetation identification sign for the beach should be ready in about a month. The Corps will be providing an extra one in case of vandalism and the paper mock up for use if more signs are needed.

Mr. Spencer indicated the final report on the project is about 15% complete and that the report should be completed in June. Still being worked on are the appendices for the monitoring program and environmental elements.

The meeting adjourned at 2:30pm.

END

DATE

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